US Army Corps
of Engineers

Nashville District

CHICKAMAUGA DAM
NAVIGATION LOCK PROJECT
SUPPLEMENT 1

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

US Army Corps of Engineers

February 2002

CHICKAMAUGA DAM
NAVIGATION LOCK PROJECT
FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Responsible Federal Agency:

U.S. Army Corps of Engineers

Cooperating Agencies:

Tennessee Valley Authority
U.S. Coast Guard
U.S. Fish and Wildlife Service

Alternatives:

(1) Construct new 110x600 foot lock (environmentally preferred alternative).
(2) Permanently close existing lock (no action alternative).
(3) Construct new 60x360 foot lock (replacement in-kind).
(4) construct new 75x400 foot lock. (National Economic Development Plan)

Location:

Hamilton County, Tennessee

Abstract:

The environmental consequences of closing the navigation lock at Chickamauga Dam on the Tennessee River at Chattanooga, Tennessee, and constructing a new lock were analyzed in the Chickamauga Dam – Navigation Lock Project Final Environmental Impact Statement (FEIS) produced by the Tennessee Valley Authority in 1996. The Corps of Engineers is adopting and supplementing TVA's 1996 EIS. This Final Supplemental Environmental Impact Statement (FSEIS) incorporates the 1996 FEIS by reference. TVA acknowledged in the 1996 FEIS that some processes such as cultural and historic resources coordination and Threatened and Endangered Species consultation had not been completed. The purpose of issuing this FSEIS is to provide information that was either not known, not required, or not completed by TVA when the 1996 FEIS was prepared, particularly in the areas of cumulative impacts, formal Section 7 consultation with the U.S. Fish and Wildlife Service, impacts to historic properties, and Section 404 of the Clean Water Act. Section 404 will be pursued under Section 404(r) of the Act.

Review comments must be received no later than April 15, 2002.

For additional information or to send review comments, contact: Mr. Wayne Easterling, Project Planning Branch, U.S. Army Corps of Engineers, P.O. Box 1070, Nashville, Tennessee 37202-1070, (615) 736-7847

EXECUTIVE SUMMARY

A 1996 Final Environmental Impact Statement (FEIS) prepared by the Tennessee Valley Authority (TVA) entitled Chickamauga Dam - Navigation Lock Project Final Environmental Impact Statement addressed the proposed construction of a new navigation lock at TVA's Chickamauga Dam at Tennessee River mile (TRM) 471.0. The Corps of Engineers (Corps), the US Fish and Wildlife Service (FWS), and the US Coast Guard (USCG) were all cooperating agencies in the preparation of that FEIS. Due to "concrete growth," the existing lock has deteriorated to the extent that it presents a safety concern and must be closed at some point in the foreseeable future. Because of the structural problems and potential safety concerns, the lock will be abandoned and plugged with concrete to make the structure a safe water barrier.

The TVA and the Corps have a unique relationship. In 1824, Congress passed two laws that marked the beginning of the Corps' continuous involvement in civil works. The General Survey Act authorized the president to have surveys made of routes for roads and canals "of national importance, in a commercial or military point of view, or necessary for the transportation of public mail." The second act, passed a month later, directed the Corps to improve navigation on the Ohio and Mississippi rivers by removing sandbars, snags, and other obstacles. Subsequently, the act was amended to include other rivers such as the Missouri. Eventually, the Corps' authority was expanded to include all inland waterways of the United States.

The Tennessee Valley Authority Act of 1933 directed TVA in part to "Improve the navigability and to provide for the flood control of the Tennessee River . . ." Thus, both the Corps and the TVA share responsibility for improving and maintaining navigation on the Tennessee River.

Through a Memorandum of Agreement between the TVA and the Corps, TVA owned and maintained Chickamauga Lock and Dam, and until 1999, the Corps performed routine maintenance and operated the lock. When it became apparent in the early 1990s that the lock had serious structural problems the TVA prepared an EIS preparatory to replacing the lock. In 1999 the Corps assumed responsibility for all maintenance of the lock as well as continuing its operations. Because of the structural stability and safety issues, both agencies are closely monitoring the lock.

After the FEIS was completed, TVA signed a Record of Decision (ROD) 1996. In 1999 the TVA requested the Corps to conduct a Principle and Guidelines compatible study of the feasibility of a new replacement lock at Chickamauga. The feasibility report was to be to the level of design detail to meet the requirements of ER 1110-2-1150, Engineering and Design of Civil Works Projects. The basis for the study was the "Final Environmental Impact Statement" (FEIS) and the "Engineering Evaluation of Navigation Facility" reports prepared by the TVA. Also, in 1999, Section 455 of the Water Resources Development Act of 2000 directed the Secretary of the Army to prepare a report of the Chief of Engineers for a replacement lock at Chickamauga Lock and Dam, Tennessee.

In preparing this report, the Corps decided to adopt and supplement TVA's 1996 Chickamauga Dam – Navigation Lock Project Final Environmental Impact Statement. TVA identified the 110 x 600 foot lock as the preferred alternative. Under the Corps' analysis the 110 x 600 foot lock is the environmentally preferred plan. By a slight margin the 75 x 400 foot lock is the National Economic Development Plan (NED). This FSEIS is only intended to address items not included in the 1996 FEIS that were not required, not complete, or not known at the time, or changes that have been suggested during subsequent evaluations. Topics that are the focus of this supplement are cumulative impacts, Fish and Wildlife Coordination, the Endangered Species Act Consultation, cultural and historic properties, and Section 404 of the Clean Water Act. Section 404 will be pursued under Section 404(r).

This Final Supplemental Environmental Impact Statement (FSEIS) incorporates the 1996 FEIS by reference.

A decision must be made as to whether to maintain navigation on the upper Tennessee River by constructing a new lock. If navigation is to be maintained, a decision must be made as to the size of the new lock before the existing lock is no longer operational. Four alternatives were considered as part of TVA's decision. These four alternatives were reviewed and are the basis for this FSEIS.

(1) Construct a new 110 x 600 foot lock (environmentally preferred alternative).

(2) Permanently close the existing lock (no action alternative).

(3) Construct a new 60 x 360 foot lock (replacement in-kind).

(4) Construct a new 75 x 400 foot lock (NED Plan).

Under the no action alternative, a replacement lock would not be built and the existing lock would be plugged. This action would eliminate navigation through Chickamauga Dam. Upstream industries dependent upon barge transportation would be forced to shift to truck or rail transport of commodities, and recreational boaters and commercial tour operators would not be able to move between Chickamauga and Nickajack Reservoirs. Environmental impacts associated with the no action alternative include the elimination of the upstream migration of fish species due to lock closure and the loss of 318 miles of navigable waterway and associated socioeconomic and infrastructure benefits.

TVA's preferred alternative was to replace the existing 60 x 360 foot lock with a new 110 x 600 foot lock. The new lock size would be consistent with locks in place downstream on the Tennessee River. If the new lock were constructed by the time the existing lock must be closed, there would be no halt to river traffic.

Analysis by the Corps has determined that the 75 x 400 foot lock is the National Economic Development Plan (NED Plan). Construction of a new 75 x 400 foot lock is estimated to cost $239.4 million. Engineering Regulation 1105-2-100 defines the NED as

"Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expresses in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed." By a slight margin the 75 x 400 foot lock is the NED. The Corps' Principles and Guidelines states that "The recommended plan must provide the maximum net NED benefits, that the NED plan must be the selected plan unless there is some overriding reason for selecting another plan, and that the recommended plan must have incremental benefits in excess of incremental costs (a positive incremental cost reduction when compared to the without-project condition)." The computation methods of the NED do not allow inclusion of some considerations such as preferable environmental aspects unless a specific dollar value can be applied. The 75 x 400 foot lock is, therefore, the Corps' recommended plan.

TVA was concerned with the safety of the structure and with preserving the Chickamauga pool. Based on both TVA's and the Corps' analyses, replacement in kind with a 60 x 360 foot lock provided the least benefits of any of the new lock alternatives. Closing the lock would be more costly both economically and environmentally than replacing the lock in kind and is not, therefore, considered a reasonable alternative. Maintaining the lock safely is becoming increasingly costly.

Environmental impacts resulting from the construction and operation of the smaller 60 x 360 or 75 x 400 foot locks would be similar to the impacts associated with the proposed 110 x 600 foot lock. The larger size lock (110 X 600 feet) is the environmentally preferred alternative because it provides the greatest benefits to socioeconomics and the best long-term environmental benefits.

The 1996 FEIS discussed the use of portage facilities around Chickamauga Dam to support upstream barge use without the construction of a new lock. However, since this use was found to be economically impractical, it was not evaluated in detail, nor is it discussed in this document.

TVA issued a draft EIS on May 10, 1995, that considered the option of continued operation of the existing lock. After release of the draft EIS, additional information found that the condition of the lock is so serious that this option was no longer available, and it was estimated the dam would have to be plugged or replaced within the next ten years. Therefore, the Final EIS did not consider the alternative to rehabilitate and continue operation of the existing lock described in the draft EIS.

Environmental impacts associated with construction of a new lock would include some loss of aquatic habitat and resident populations of freshwater mussels, including at least one Federally listed endangered species (pink mucket, *Lampsilis abrupta*). Relocating the mussels and other possible actions to be determined during consultation with the FWS would mitigate these losses. In addition, the snail darter, (*Percina tanasi*) has also been found in the area. Formal consultation has been initiated with FWS and FWS is preparing both a Biological Opinion and a Coordination Act Report. Disposal sites would be

landscaped and vegetated, and potential impacts to a Federally threatened plant (mountain skullcap, *Scutellaria montana*) located adjacent to a disposal site would be avoided through maintenance of a contiguous 250 foot forest buffer zone. A new lock would necessitate modifying the existing historic dam complex. The State Historic Preservation Officer (SHPO) has determined that all of the alternatives would have an adverse impact on the dam. A Section 106 review followed by a Memorandum of Agreement between the SHPO, the Corps, and TVA will, therefore, be required.

Environmental impacts associated with the operation of a new lock would include socioeconomic benefits associated with the continuation of commercial and recreational lockages, and the loss of four spillway bays. Through appropriate design of the new lock valves or discharge structures, attempts to minimize potential adverse impacts on the upstream migration of certain fish species, such as sauger, would be made. Under the No Action alternative no fish migration would be possible.

After closure of the old lock, shipper savings, both for existing traffic and expected traffic growth, would accrue to the new lock. It is estimated that the benefit-cost ratio of the new project would be 2.8, that is, for each federal dollar spent on the project, $2.80 would be returned to the nation in shipper savings benefits.

Selection of any of the new lock alternatives would allow recreational boaters to continue to navigate between Nickajack and Chickamauga Reservoirs. The larger lock sizes would facilitate more efficient movement of recreational boaters during special events.

TVA's selection of the preferred alternative (construct a new 110 X 600 foot lock) was based on environmental, social, economic, recreational, engineering, and public safety analyses. The Corps is monitoring the structural integrity of the existing lock until it is closed. The Corps is also making the necessary repairs to keep the lock in operation as long as possible, while undertaking engineering design work for a new lock. Construction of a new lock would have to be initiated five years prior to the permanent closure of the existing lock if navigation is to be maintained on the upper Tennessee River.

Table of Contents

List of Tables

List of Figures

1.0 Purpose And Need For Action

1.1 Background The existing navigation system on the Tennessee River comprises nine multipurpose lock-and-dam projects having a total of 13 locks. Navigation pools on the Tennessee River range in length from 16 miles between Wilson and Wheeler Dams to 184 miles between Kentucky and Pickwick Dams. The mainstem pools provide a nine-foot navigable channel along the entire 652-mile length of the Tennessee except for a three-mile stretch at Knoxville where the depth diminishes to six feet.

The upper Tennessee River segment consists of the three navigation reservoirs formed by the Chickamauga, Watts Bar, and Fort Loudoun Dams. This river segment begins at river mile 471.0, the site of the Chickamauga Lock and Dam and extends 181 miles to river mile 652.0, the confluence of the Holston and French Broad Rivers at Knoxville. The Clinch and Emory, Hiwassee, and Little Tennessee Rivers are the major navigable tributaries to the upper Tennessee segment. Limited backwater navigation is also available on some other tributaries, including Soddy Creek, Piney River, King Creek, Little River, and French Broad River. Completed in 1940, Chickamauga Lock and Dam is located at mile 471.0 on the Tennessee River, about 13 miles upstream from the Port of Chattanooga, Tennessee.

Chickamauga Lock is experiencing structural problems resulting from alkali aggregate reaction (AAR). AAR is a reaction between the alkali in the cement and the rock aggregate, which results in a physical expansion of concrete structures. This expansion of the concrete threatens the structural integrity of the lock and has created an unsafe condition in the lock. It is no longer economically feasible to continue to repair Chickamauga lock. Therefore, it is estimated the lock would have to be closed within the next 10 years.

The TVA and the Corps of Engineers have a unique relationship. In 1824, Congress passed two laws that marked the beginning of the Corps' continuous involvement in civil works. The General Survey Act authorized the president to have surveys made of routes for roads and canals "of national importance, in a commercial or military point of view, or necessary for the transportation of public mail." The second act, passed a month later, directed the Corps to improve navigation on the Ohio and Mississippi Rivers by removing sandbars, snags, and other obstacles. Subsequently, the act was amended to include other rivers such as the Missouri. Eventually, the Corps' authority was expanded to include all inland waterways of the United States.

The Tennessee Valley Authority Act of 1933 directed TVA in part to "Improve the navigability and to provide for the flood control of the Tennessee River . . ." Thus, both the Corps and the TVA share responsibility for improving navigation on the Tennessee River.

Through a Memorandum of Agreement between the TVA and the Corps, TVA owned and performed major maintenance on Chickamauga Lock and Dam, but the Corps operated the lock and performed routine maintenance. When it became apparent in the early 1990s that

the lock had serious structural problems the TVA prepared an EIS preparatory to replacing the lock. In 1999 the Corps assumed all responsibility for maintaining the lock as well as continuing its operations subject to congressional appropriations.

It is no longer cost effective to maintain the existing lock. Closure of the lock, however, would effectively sever 318 miles of navigable waterways and all of the related infrastructure and benefits from the rest of the country.

After the FEIS was completed, a Record of Decision (ROD) was signed in 1996. In 1999 the TVA requested the U.S. Army Corps of Engineers to conduct a Principle and Guidelines compatible study of the feasibility of a new replacement lock at Chickamauga. The feasibility report for the TVA was to be to the level of design detail to meet the requirements of ER 1110-2-1150, Engineering and Design of Civil Works Projects. The basis for the study was the "Final Environmental Impact Statement" (FEIS) and the "Engineering Evaluation of Navigation Facility" reports prepared by the TVA. Also, in 1999, Section 455 of the Water Resources Development Act of 2000 directed the Secretary to prepare a report of the Chief of Engineers for a replacement lock at Chickamauga Lock and Dam, Tennessee. This FSEIS is only intended to address items not included in the 1996 FEIS that were not required, not complete, or not known at the time, or changes that have been suggested during subsequent evaluations. Topics that are the focus of this supplement are cumulative impacts, Fish and Wildlife Coordination Act, the Endangered Species Act Consultation, cultural and historic properties, and Section 404 of the Clean Water Act. Compliance with Section 404 will be undertaken thrugh the Section 404(r) process.

In preparing this report, the Corps decided to adopt and supplement TVA's 1996 Chickamauga Dam – Navigation Lock Project Final Environmental Impact Statement. This Final Supplemental Environmental Impact Statement (FSEIS) incorporates the 1996 FEIS by reference.

1.2 Public Review Process

In preparing this FSEIS, a Scoping Letter was issued to all known interested individuals and a Notice of Intent was published in the Federal Register. Both of these actions occurred in August 2001. A total of eleven letters were received in response to these notices. All eleven were from industries or agencies and all were supportive of the proposed project. No issues or concerns were raised. Some did, however, identify some secondary or cumulative effects. After the DSEIS was released for comment, approximately 40 additional letters were received. All of the letters received and the responses to comments are included in Appendix D.

1.3 Consultation and Required Permits Construction of a new lock would necessitate obtaining federal, state, and local permits. Anticipated permits and other approvals include:

- National Pollutant Discharge Elimination System (NPDES) stormwater permits (This will be sought immediately before construction begins)
- U.S. Army Corps of Engineers Section 404 permits (Being pursued under Section 404(r)
- State Water Quality permits (A State Water Quality Certification will be requested. Under the rules of Section 404(r) of the Clean Water Act, if the state cannot provide water quality certification and Congress authorizes the project after seeing the FSEIS, certification will not be required.)
- U.S. Coast Guard bridge permit (A bridge permit will be requested and must be received before the bridges are altered or constructed)
- Spill Prevention Control and Counter-Measures (SPCC) (These will be developed by the contractor prior to the beginning of construction)
- Air Quality (Air quality is not currently a concern. If vegetation is to be burned on site appropriate burning permits will be obtained prior to any burning)
- Solid Waste Disposal (Solid waste will be disposed of in accordance with applicable ordinances and permit conditions)
- Sediment and Erosion Control (BMPs such as sediment traps and silt fences will be in place around the upland disposal sites to filter return water before it returns to the river system. As soon as practical all disturbed sites will be seeded or mulched to prevent erosion. As stated above, an NPDES (stormwater) permit will be requested prior to construction activities)
- Road Relocation (Road relocations will be coordinated through state and local transportation departments)
- National Historic Preservation Act – Section 106 review (Consultation with the State Historic Preservation Officer is currently underway)
- Section 7 – Endangered Species Act (Formal Consultation has been initiated with FWS. A Biological Opinion is anticipated in the immediate future.)
- FWS Coordination Act Report (A FWS Final Coordination Act Report has been received and is exhibited in Appendix B. The FWS recommendations have been adopted)

- No Rise Certification for Compliance with Chattanooga Floodplain Regulations (No Rise Certification will be requested. None of the project activities will significantly affect the floodplain or floodway)
- TVA 26(a) permit

2.0 Alternatives Including Proposed Action

This section describes four alternatives to address the concrete growth in the existing lock at Chickamauga Dam. As discussed below, it is no longer feasible to maintain the lock and it must be closed within the next ten years. To close the existing lock, a concrete plug would be poured into the lock chamber to form a permanent water barrier and to assist in maintaining the structural stability of the dam. The existing lock must be closed because as concrete growth continues, partial loss of control of the upstream reservoir could result.

Although a true No Action plan would require the lock to be operated as normal until failure, that was not considered to be a reasonable alternative because of the implications for dam safety, and navigation. Therefore, the No Action alternative is defined as closing and plugging the lock. In preparing this document the Corps is not evaluating any new alternatives. The alternatives being considered include: construction of a new 110 x 600 foot lock (environmentally preferred alternative); construction of a new 75 x 400 foot lock (NED Plan and recommended plan); construction of a new 60 x 360 foot lock (replacement in-kind); and permanent closure of the lock (No Action). These alternatives are unchanged from the 1996 FEIS. Figure 1 depicts Chickamauga Lock as it currently exists. Figures 2 and 3 are concepts of how a new lock would be situated, and Figure 4 is a concept drawing.

The 1996 FEIS also proposed widening a two-mile stretch of the navigation channel through Colwell Bend. This channel widening, and its associated impacts are no longer being considered.

2.1 Description of Alternatives

2.1.1 Construct New 110 x 600 Foot Lock TVA's preferred alternative in the 1996 FEIS was to maintain and improve navigation at Chickamauga Dam by initiating construction of a 110 x 600 foot lock at the project five years before the existing lock is decommissioned. This alternative would allow the new lock to be opened for service before closure of the existing lock. The 110 x 600 foot lock represents the general standard for locks on the lower Tennessee River. The size of the 110 x 600 foot lock is well suited for the barges in use today. Eight jumbo barges can be locked with the towboat in one lockage, which requires about one hour. At this lockage capacity, about 12,000 tons of dry cargo can be processed in one lockage in a 110 x 600 foot lock. Similarly, a standard liquid tow of three barges can also be processed in one lockage.

The proposed lock would be located on the riverside of the existing lock and downstream of the existing dam (see Figure 5). The downstream location would allow use of the existing spillway dam as an upstream water barrier during construction of the new lock. The riverside location for the new lock would cause the loss of four spillway bays,

Existing Chickamauga Lock

Approximate Footprint of New Lock

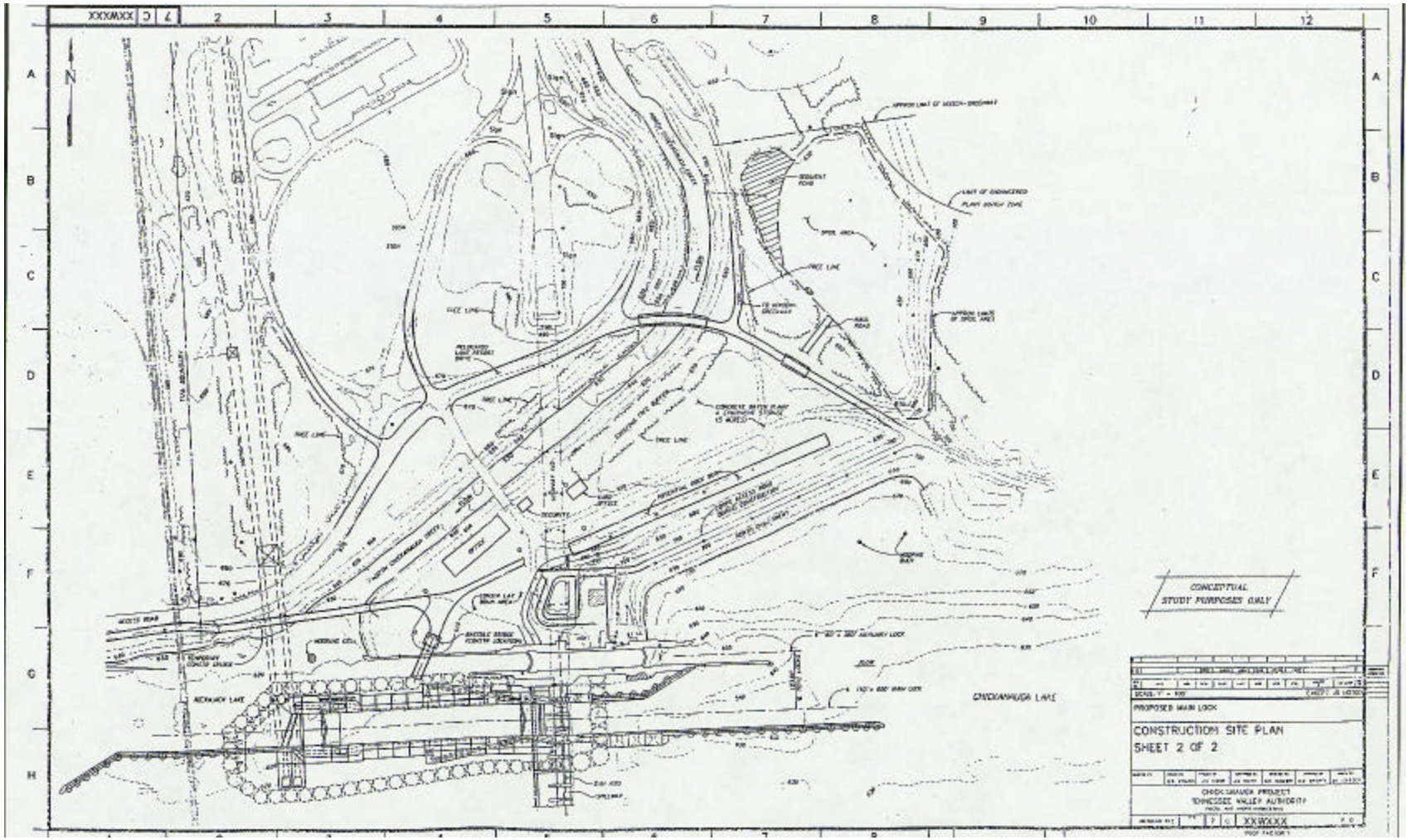
CONCEPTUAL
STUDY PURPOSES ONLY
CONSTRUCTION SITE PLAN
SHEET 2 OF 2
CHICKAMAUGA LAKE

Figure 3

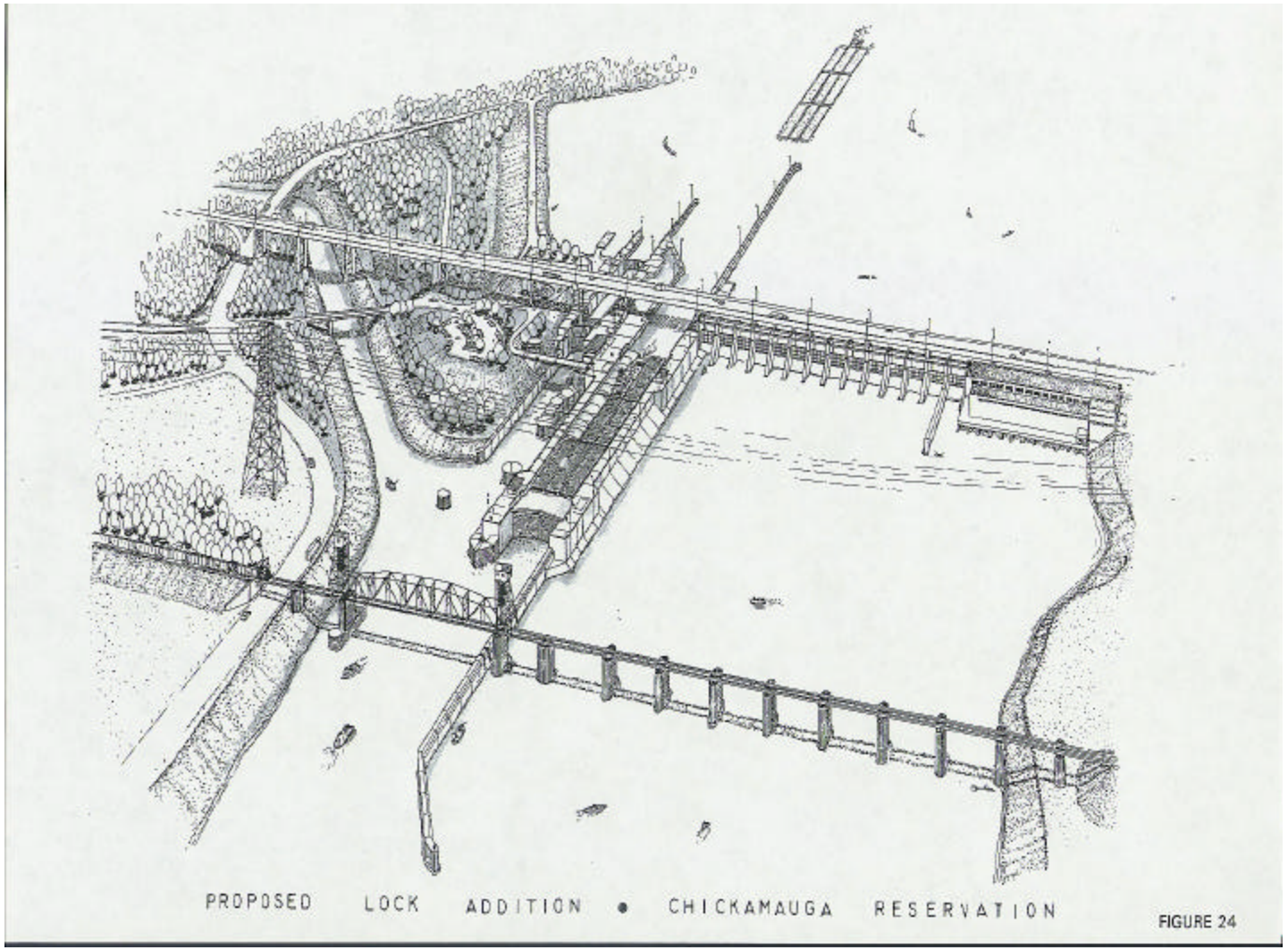
PROPOSED LOCK ADDITION • CHICKAMAUGA RESERVATION
FIGURE 24

Figure 4

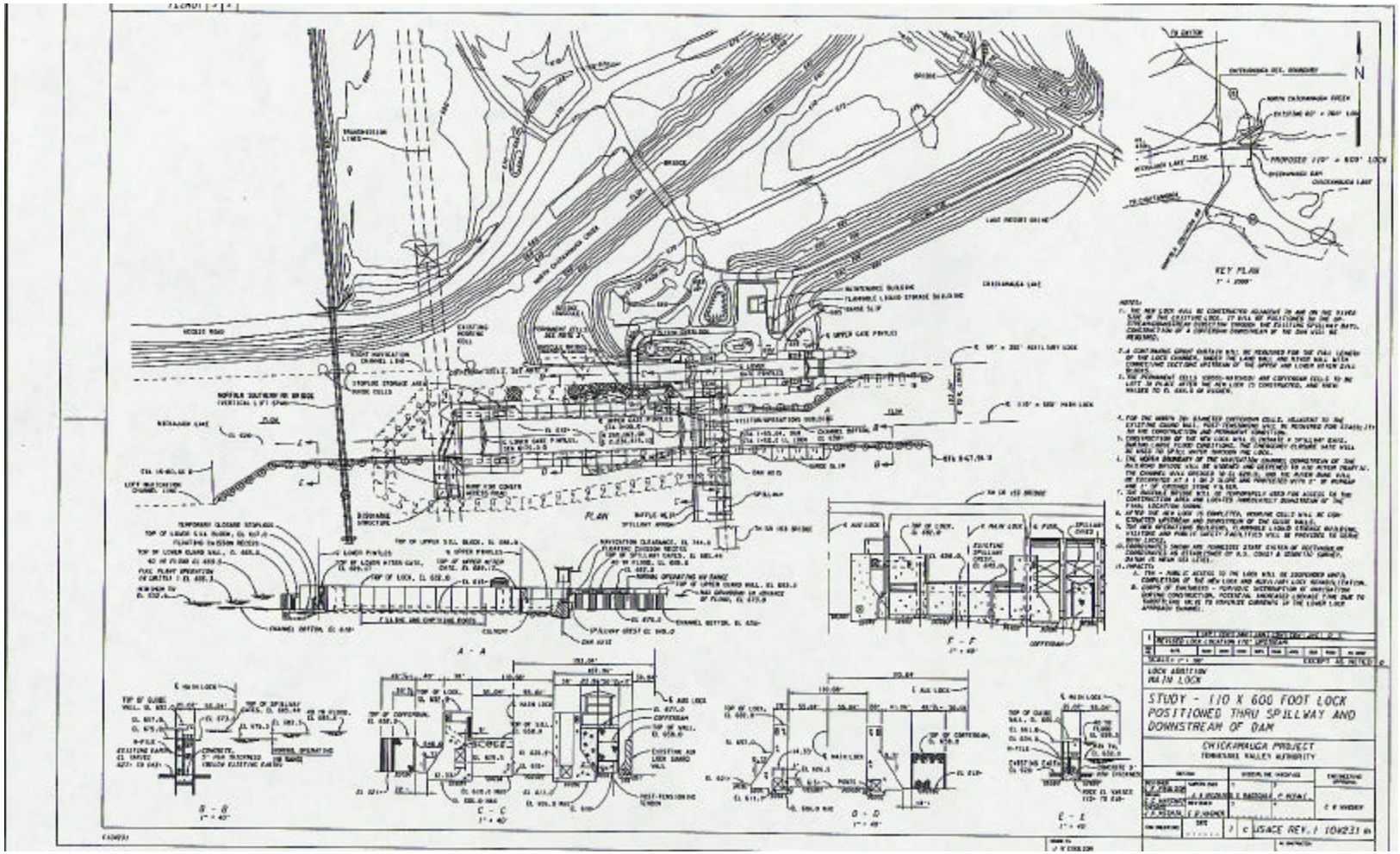
KEY PLAN
PLAN
A - A
B - B
C - C
D - D
E - E
F - F
LOCK ADDITION
MAIN LOCK
STUDY - 110 X 600 FOOT LOCK POSITIONED THRU SPILLWAY AND DOWNSTREAM OF DAM
CHICKAMAUGA PROJECT
TENNESSEE VALLEY AUTHORITY

Figure 5

eventually requiring the removal of four gates and a portion of three concrete piers. Part of the downstream approach wall to the existing lock also would be removed. To provide a downstream water barrier during construction, a sheet pile cofferdam connecting the dam and existing lock would be constructed. A temporary bascule-type drawbridge would be constructed across the lower approach to the existing lock to provide access to the new lock construction site within the cofferdam. After the cofferdam is removed, the bascule bridge would be relocated to provide a permanent access bridge to the new lock. Vertical and horizontal clearances and operational procedures for the bridges would require approval by the U.S. Coast Guard. Upstream and downstream approach walls, up to 600 feet in length, would be built on the spillway side, with the downstream approach wall extending under and through the Norfolk Southern Railway Bridge. A temporary navigation channel would necessitate approximately 3,200 feet of the navigation channel would be widened immediately downstream of the existing lock. This would require the excavation or dredging of approximately 123,000 cubic yards of substrate and the blasting and removal of approximately 181,000 cubic yards of rock below Ordinary High Water. This would be necessary to allow safe passage of shipping to the existing lock while the new lock is being constructed. After construction is complete it would not be needed. As a part of the environmental design, the Corps has proposed to spread cobbles from the cofferdams over the temporary lock approach to restore aquatic habitat and to avoid the need for additional upland disposal. There is some concern, however, that the strong currents in the area would move the cobble sized rock downstream into less turbulent areas. This, in turn, could adversely impact mussels and other benthic organisms. Detailed physical modeling will be required to determine if the material will stay in place. Two new 30 foot diameter mooring cells would be built downstream of the new lock. The State Road (SR) 153 bridge across the lock would remain open during construction, and Lake Resort Drive would be relocated. As part of the relocation of Lake Resort Drive, two new bridges would be built, one over North Chickamauga Creek and one for grade separation between Lake Resort Drive and the permanent access road to the North Chickamauga Creek Greenway. Improvements would be made to the intersection of Access Road and Lake Resort Drive. The existing lock operations building would be demolished. The new lock operations building would be a three-level structure with the top level serving as the operations center, the middle level as a visitor area and assembly room, and the lowest level as an electrical equipment and transformer room.

The existing bridge over North Chickamauga Creek would serve as the primary approach to the new visitor facility. The existing visitor's parking lot adjacent to the earthen dam would be used as part of the construction laydown area. The existing visitor overlook would be removed and replaced by a new overlook adjacent to the existing lock's lower mitre gates. A detailed description of the proposed lock is contained in TVA's engineering study (1996a) entitled *Chickamauga Project Engineering Evaluation of Navigation Facility.*

A new 80-car parking area would be constructed on earth fill adjacent to the overlook. The fill would bring the parking facility up in elevation to allow better access for the physically handicapped and would facilitate better access to the area. The parking lot would be curbed and sidewalks would be provided.

A two-lane road would connect the Hixson Greenway area to the lock access road. It would pass under relocated Lake Resort Drive using the same bridge provided for construction access to an upland disposal area (See Figure 6).

TVA and the Corps would continue to monitor the structural integrity of the existing lock until the new lock is completed and the existing lock would be closed to navigation. This action would make the structure a safe water barrier. Once the lock is closed, a portion of the lock chamber and the associated wall culverts would be plugged with concrete. The upper and lower mitre gates would be removed. Post-tensioning would strengthen walls, and wider slots would be cut in the approach walls to prevent problems from continued concrete growth. Miscellaneous equipment and buildings would be removed. No cofferdams would be required; however, installation of needle dams (similar to a cofferdam but more temporary) and dewatering of the chamber would be required.

2.1.2 Lock Closure (No Action Alternative) Under this alternative, no new lock would be constructed. As with all of the alternatives, the existing lock would continue to be monitored for structural integrity until it is closed. As discussed above, once the lock is closed, a portion of the lock chamber and the associated wall culverts will be plugged with concrete. The upper and lower mitre gates would be removed. Post-tensioning would strengthen walls, and wider slots would be cut in the approach walls to prevent problems from continued concrete growth. Miscellaneous equipment and buildings would be removed. No cofferdams would be required; however, installation of needle dams (similar to a cofferdam but more temporary) and dewatering of the chamber would be required.

2.1.3 Construct New 60 x 360 Foot Lock Under this alternative, a new 60 x 360 foot lock would be constructed to maintain the status quo at Chickamauga Dam. Project design, engineering, and site modifications are basically the same as for the larger 110 x 600 foot lock. Construction laydown and disposal areas and channel excavation quantities would be similar to those discussed for the larger lock. Only one jumbo barge or one standard liquid tow can be locked in one lockage, which requires about one hour. An eight-barge tow would take about 8 hours. At this lockage capacity, about 1,500 tons of dry cargo can be processed in one lockage.

The proposed lock would be located on the riverside of the existing lock and downstream of the existing dam (see Figure 7). The downstream location would allow use of the existing spillway dam as an upstream water barrier during construction of the new lock. The riverside location for the new lock would cause the loss of four spillway bays, eventually requiring the removal of four gates and a portion of three concrete piers. Part of the downstream approach wall to the existing lock also would be removed. To provide a downstream water barrier during construction, a sheet pile cofferdam connecting the dam and existing lock would be constructed. A temporary bascule-type drawbridge would be

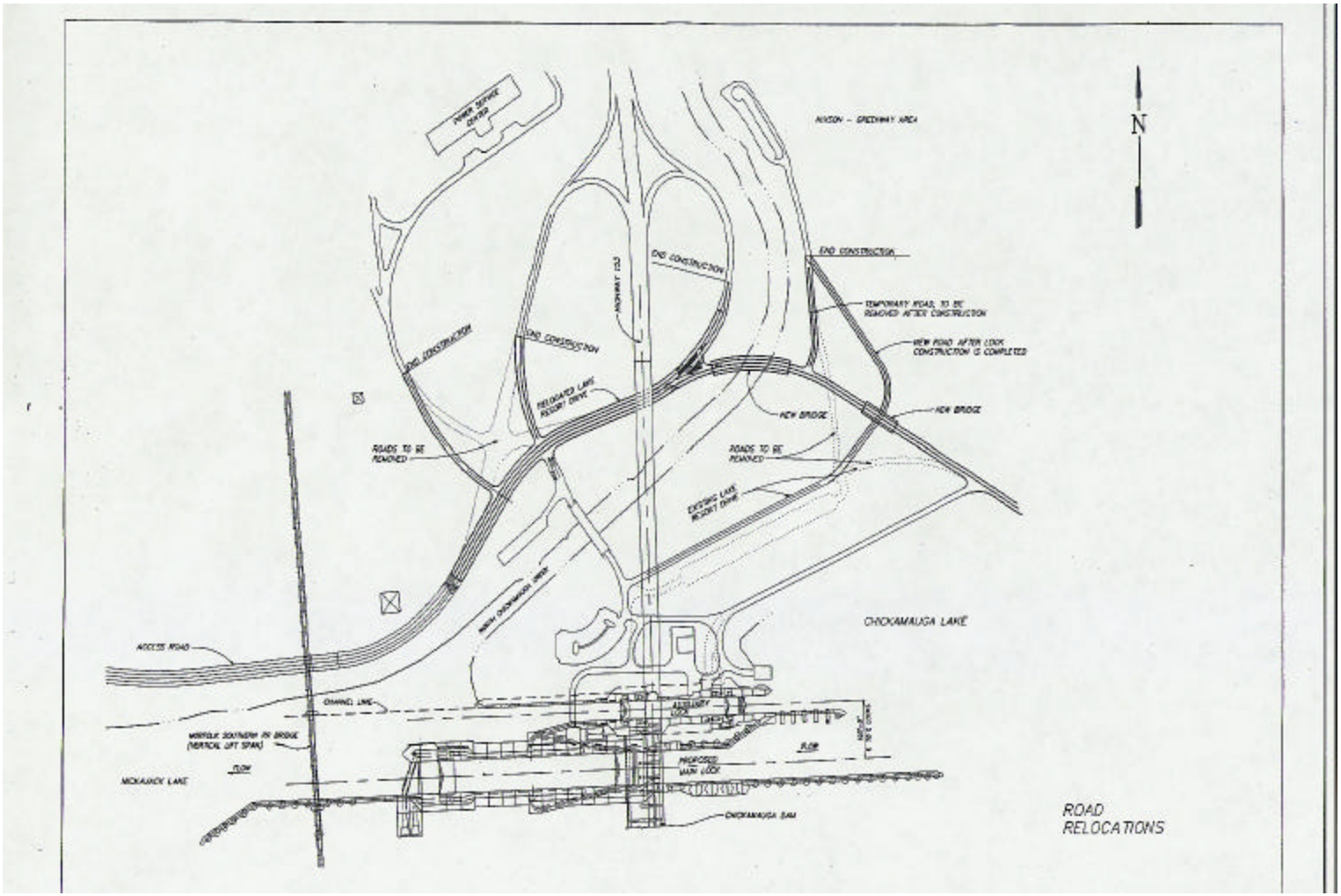
N
END CONSTRUCTION
TEMPORARY ROAD, TO BE REMOVED AFTER CONSTRUCTION
NEW ROAD AFTER LOCK CONSTRUCTION IS COMPLETED
NEW BRIDGE
RELOCATED LAKE RESORT DRIVE
ROADS TO BE REMOVED
EXISTING LAKE RESORT DRIVE
CHICKAMAUGA LAKE
ACCESS ROAD
CHANNEL LINE
MOCCASIN BEND
ROAD
RELOCATIONS

Figure 6

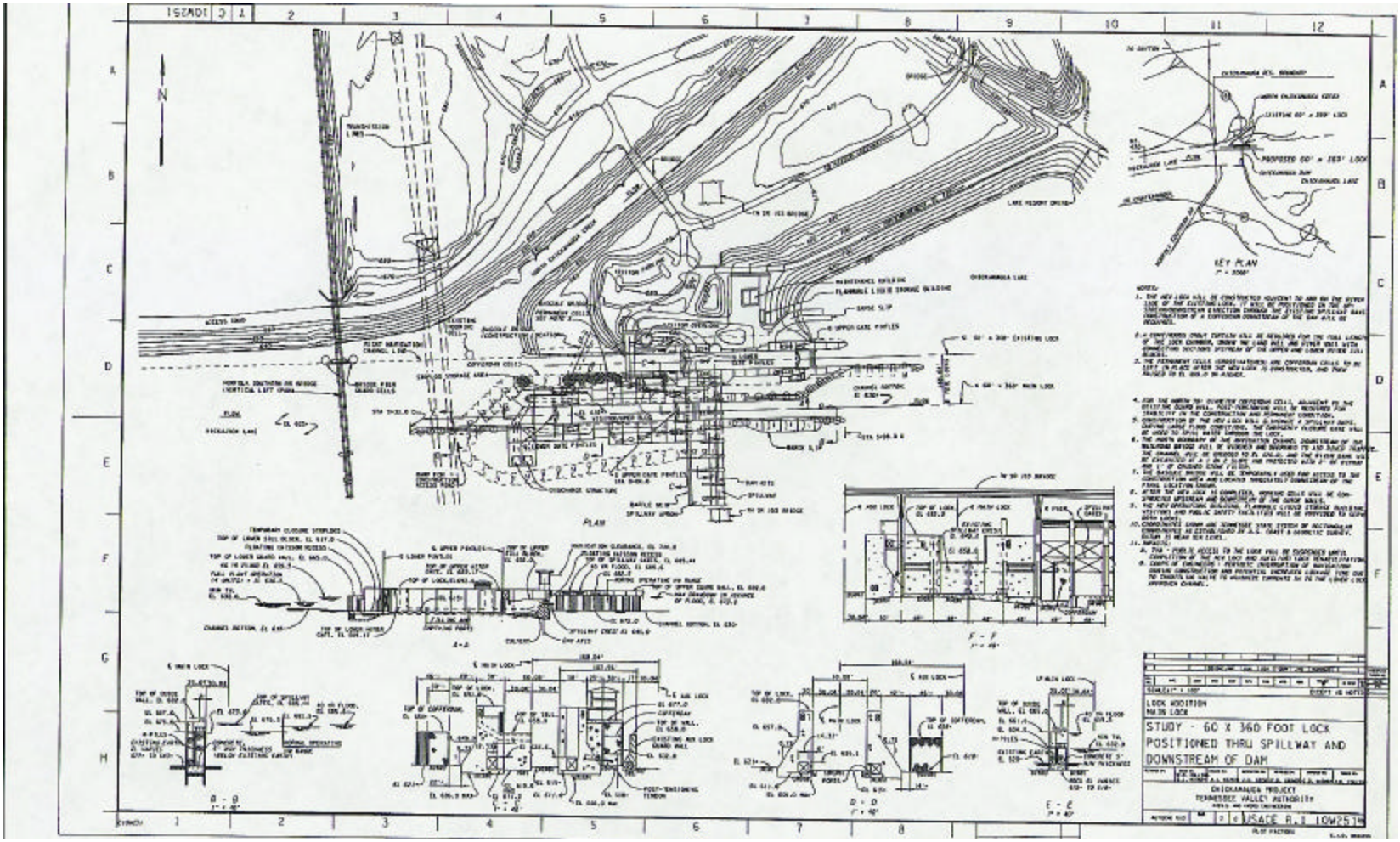
KEY PLAN
STUDY - 60 X 360 FOOT LOCK
POSITIONED THRU SPILLWAY AND
DOWNSTREAM OF DAM
TENNESSEE VALLEY AUTHORITY

Figure 7

constructed across the lower approach to the existing lock to provide access to the new lock construction site within the cofferdam. After the cofferdam is removed, the bascule bridge would be relocated to provide a permanent access bridge to the new lock. Vertical and horizontal clearances and operational procedures for the bridges would require approval by the U.S. Coast Guard. Upstream and downstream approach walls, up to 800 feet in length, would be built on the spillway side, with the downstream approach wall extending under and through the Norfolk Southern Railway Bridge. This would require the excavation or dredging of approximately 123,000 cubic yards of substrate and the blasting and removal of approximately 181,000 cubic yards of rock below Ordinary High Water. This would be necessary to allow safe passage of shipping to the existing lock while the new lock is being constructed. After construction is complete it would not be needed. As a part of the environmental design, the Corps has proposed to spread cobbles from the cofferdams over the temporary lock approach to restore aquatic habitat and to avoid the need for additional upland disposal. There is some concern, however, that the strong currents in the area would move the cobble sized rock downstream into less turbulent areas. This, in turn, could adversely impact mussels and other benthic organisms. Detailed physical modeling will be required to determine if the material will stay in place. This work would require the excavation or dredging of approximately 123,000 cubic yards of substrate and the blasting and removal of approximately 181,000 cubic yards of rock below Ordinary High Water. Two new 30 foot diameter mooring cells would be built downstream of the new lock. The State Road (SR) 153 bridge across the lock would remain open during construction, and Lake Resort Drive would be relocated. As part of the relocation of Lake Resort Drive, two new bridges would be built, one over North Chickamauga Creek and one for grade separation between Lake Resort Drive and the permanent access road to the North Chickamauga Creek Greenway. Improvements would be made to the intersection of Access Road and Lake Resort Drive. The existing lock operations building would be demolished. The new lock operations building would be a three-level structure with the top level serving as the operations center, the middle level as a visitor area and assembly room, and the lowest level as an electrical equipment and transformer room.

Primary vehicle access to the facility would be by the existing bridge over North Chickamauga Creek. The existing visitor's parking lot adjacent to the earthen dam would be used as part of the construction laydown area. The existing visitor overlook would be removed and replaced by a new overlook adjacent to the existing lock's lower mitre gates. A detailed description of the proposed lock is contained in TVA's engineering study (1996a) entitled *Chickamauga Project Engineering Evaluation of Navigation Facility.*

A new 80-car parking area would be constructed on earth fill adjacent to the overlook. The fill would bring the parking facility up in elevation to allow better access for the physically handicapped and would facilitate better access to the area. The parking lot would be curbed and sidewalks would be provided.

A two-lane road would connect the Hixson Greenway area to the lock access road. It would pass under relocated Lake Resort Drive using the same bridge provided for construction access to an upland disposal area (See Figure 6).

TVA and the Corps would continue to monitor the structural integrity of the existing lock until the new lock is completed and the existing lock would be closed to navigation. This action would make the structure a safe water barrier. Once the lock is closed, a portion of the lock chamber and the associated wall culverts would be plugged with concrete. The upper and lower mitre gates would be removed. Post-tensioning would strengthen walls, and wider slots would be cut in the approach walls to prevent problems from continued concrete growth. Miscellaneous equipment and buildings would be removed. No cofferdams would be required; however, installation of needle dams (similar to a cofferdam but more temporary) and dewatering of the chamber would be required.

2.1.4 Construct New 75 x 400 Foot Lock Under this alternative, a new 75 x 400 foot lock would be constructed. Project design, engineering, and site modifications are basically the same as for the larger 110 x 600 foot lock. Construction laydown and disposal areas and channel excavation quantities would be similar to those discussed for the larger lock would be similar to those discussed for the larger lock. Four jumbo barges or one standard liquid tow can be locked in one lockage, which requires about one hour. An eight-barge tow, including the towboat, would take about 3 hours. At this lockage capacity, about 6,000 tons of dry cargo can be processed in one lockage.

The proposed lock would be located on the riverside of the existing lock and downstream of the existing dam (see Figure 8). The downstream location would allow use of the existing spillway dam as an upstream water barrier during construction of the new lock. The riverside location for the new lock would cause the loss of four spillway bays, eventually requiring the removal of four gates and a portion of three concrete piers. Part of the downstream approach wall to the existing lock also would be removed. To provide a downstream water barrier during construction, a sheet pile cofferdam connecting the dam and existing lock would be constructed. A temporary bascule-type drawbridge would be constructed across the lower approach to the existing lock to provide access to the new lock construction site within the cofferdam. After the cofferdam is removed, the bascule bridge would be relocated to provide a permanent access bridge to the new lock. Vertical and horizontal clearances and operational procedures for the bridges would require approval by the U.S. Coast Guard. Upstream and downstream approach walls, up to 800 feet in length, would be built on the spillway side, with the downstream approach wall extending under and through the Norfolk Southern Railway Bridge. Approximately 3,200 feet of the navigation channel would be widened immediately downstream of the existing lock. This would be necessary to allow safe passage of shipping to the existing lock while the new lock is being constructed. After construction is complete it would not be needed. As a part of the environmental design, the Corps has proposed to spread cobbles from the cofferdams over the temporary lock approach to restore aquatic habitat and to avoid the need for additional upland disposal. There is some concern, however, that the strong currents in the area would move the cobble sized rock downstream into less turbulent areas. This, in turn, could adversely impact mussels and other benthic organisms. Detailed physical modeling will be required to determine if the material will stay in place. This work would require the excavation or dredging of approximately 123,000

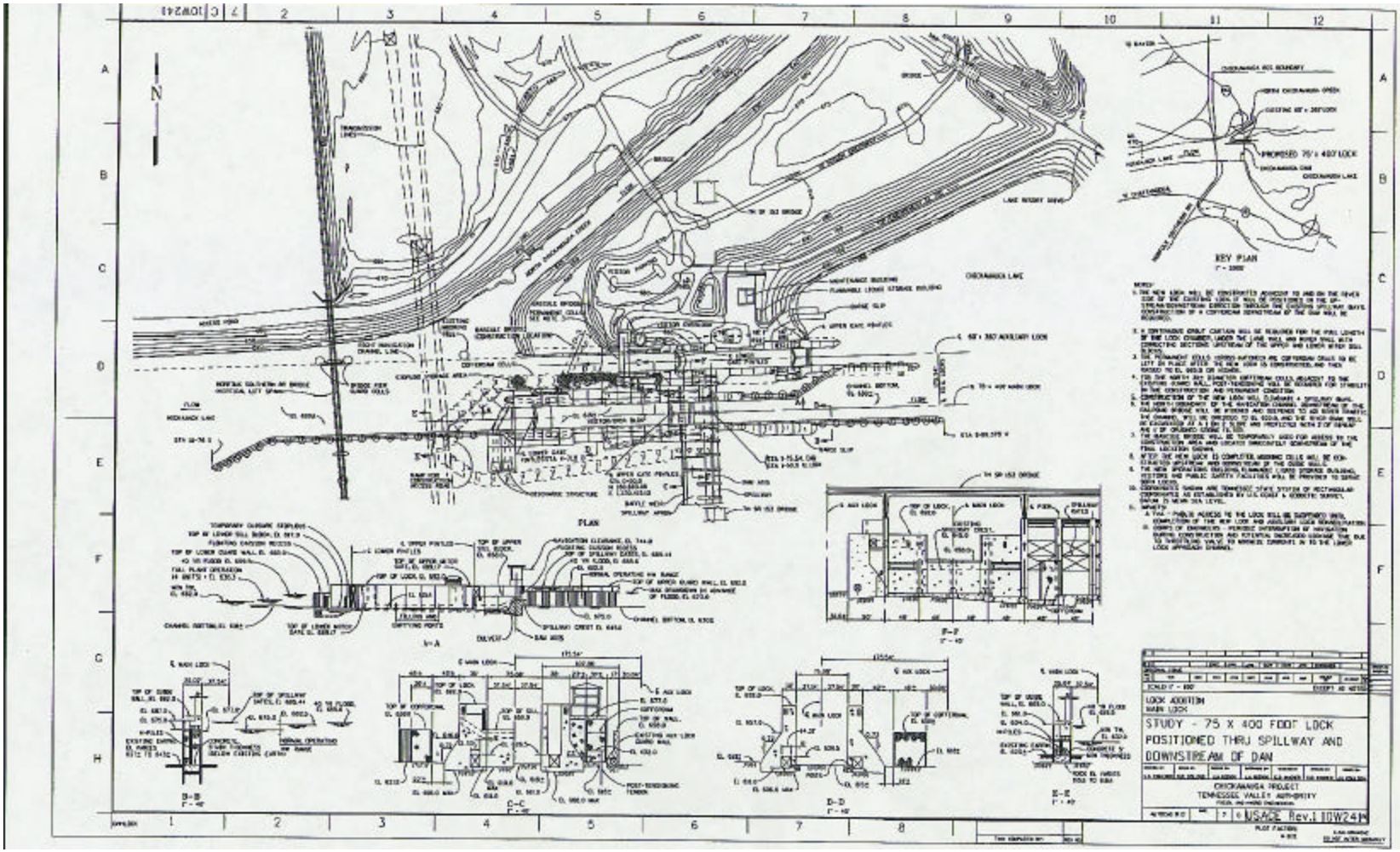
KEY PLAN
PLAN
STUDY - 75 X 400 FOOT LOCK
POSITIONED THRU SPILLWAY AND
DOWNSTREAM OF DAM
CHICKAMAUGA PROJECT
TENNESSEE VALLEY AUTHORITY
USACE Rev.1 10W24M

Figure 8

cubic yards of substrate and the blasting and removal of approximately 181,000 cubic yards of rock below Ordinary High Water. Two new 30 foot diameter mooring cells would be built downstream of the new lock. The State Road (SR) 153 bridge across the lock would remain open during construction, and Lake Resort Drive would be relocated. As part of the relocation of Lake Resort Drive, two new bridges would be built, one over North Chickamauga Creek and one for grade separation between Lake Resort Drive and the permanent access road to the North Chickamauga Creek Greenway. Improvements would be made to the intersection of Access Road and Lake Resort Drive. The existing lock operations building would be demolished. The new lock operations building would be a three-level structure with the top level serving as the operations center, the middle level as a visitor area and assembly room, and the lowest level as an electrical equipment and transformer room.

Primary vehicle access to the facility would be by the existing bridge over North Chickamauga Creek. The existing visitor's parking lot adjacent to the earthen dam would be used as part of the construction laydown area. The existing visitor overlook would be removed and replaced by a new overlook adjacent to the existing lock's lower mitre gates. A detailed description of the proposed lock is contained in TVA's (1996) engineering study entitled *Chickamauga Project Engineering Evaluation of Navigation Facility.*

A new 80-car parking area would be constructed on earth fill adjacent to the overlook. The fill would bring the parking facility up in elevation to allow better access for the physically handicapped and would facilitate better access to the area. The parking lot would be curbed and sidewalks would be provided.

A two-lane road would connect the Hixson Greenway area to the lock access road. It would pass under relocated Lake Resort Drive using the same bridge provided for construction access to an upland disposal area (See Figure 6).

TVA and the Corps would continue to monitor the structural integrity of the existing lock until the new lock is completed and the existing lock would be closed to navigation. This action would make the structure a safe water barrier. Once the lock is closed, a portion of the lock chamber and the associated wall culverts would be plugged with concrete. The upper and lower mitre gates would be removed. Post-tensioning would strengthen walls, and wider slots would be cut in the approach walls to prevent problems from continued concrete growth. Miscellaneous equipment and buildings would be removed. No cofferdams would be required; however, installation of needle dams (similar to a cofferdam but more temporary) and dewatering of the chamber would be required.

2.1.5 Alternatives Not Considered in Detail In addition to the alternatives discussed above, other alternatives were briefly considered. Continued operation and maintenance of the existing lock was quickly shown to not be economically feasible. Portage systems were not economically viable. Larger lock sizes were considered for incremental analysis purposes, but were eliminated from further consideration. Because of safety issues a true no action alternative, i.e. operate until failure, was not, and is not being considered.

Plugging the lock would be required for all four alternatives.

2.2 Summary of Indirect and Cumulative Impacts

2.2.1 Socioeconomics. Socioeconomics impacts are regional in scope. For the purposes of this assessment, the entire upper end of the Tennessee River system was considered. The river system was much different prior to the construction of the dam. Native Americans and European settlers used the river to move trade goods in canoes, rafts, small boats, and later by steamboat. River navigation increased over time. Largely as a result of the river and its cheap transportation, the region grew and prospered.

Socioeconomics in the region have seen steady gradual growth. Today Chattanooga has a diverse economy that includes manufacturing, services, agriculture, transportation, finance, and construction.

River navigation, and therefore, to a degree, the regional growth and prosperity is currently limited due to the small size of the lock, which can only accommodate one jumbo or supertanker barge at a time. Longer delays result in additional costs and in time and fuel for tugs. As delays increase, more river traffic shifts to alternative rail and road transportation. Socioeconomic conditions include the demand for products transported by the river system and transportation costs for river traffic versus alternative modes of transport.

In addition, due to the long-term unreliability of the lock, business development is reluctant to locate new facilities or infrastructure above Chickamauga Lock and Dam. Some goods have been forced to shift to alternative modes of transportation. The alternative modes, i.e., truck and rail, may be less time consuming and less expensive for shipping costs in the short run, but they also add considerably to fuel consumption, road congestion and degradation, accidents including injuries and fatalities, and air pollution.

River navigation is important to the regional economy of the eastern Tennessee area as well as the Nation as a whole. Closure of the lock would sever more than 300 miles of inland navigation, about a third of the entire Tennessee River System. Simply replacing the lock in kind would only maintain the status quo. It would hinder, but not eliminate future growth in either the navigation system or the region. Replacement with either a 75 x 400 foot or a 110 x 600 foot lock would result in an immediate reduction in transportation costs. This saving due to reduction in time and fuel consumption due to fewer lockages would contribute to the regional and national economic development, and would facilitate future growth of the navigation system and industry. Although the lock is important for maintaining the status quo, it could play a larger role if it was rebuilt as either a 75 x 400 or 110 x 600 foot size.

2.2.2 Recreation/Tourism

Recreation and tourism are closely tied to socioeconomics. Future conditions are expected to be similar to the baseline with an increase over time. Residential

development in the areas adjacent to the lakes will likely grow at a faster rate with construction of recreational second-homes.

Recreation quality is affected by the availability of adequate facilities. Long waits for lockage times can detract from the perceived quality and can impact organized events. Recreation resources are generally available but may be less attractive during high use (holiday) periods due to crowding and longer waits. Organized events like the Riverbend Festival, Annual Fall Color Cruise, and Folk Festival may take several lockages due to the number of vessels involved. Recreation is affected by socioeconomic factors (dollars available to spend), the availability of recreational facilities, and the availability of resources such as a healthy population of game fish.

More than 80 marinas currently exist above Chickamauga Lock. They service thousands of recreational pleasure craft. Closure of the lock would severely limit the use of the river system by these recreators.

The cumulative impacts of the lock and dam system have had an impact on recreation and tourism in Tennessee. Although the lock is not as important to recreation as it is to navigation, closure would curtail some events. As recreation dollars are spent they have a large ripple or cumulative effect in the local economy.

2.2.3 River Navigation

The river systems were much different prior to the construction of the current system of locks and dams. Shoals and snags frequently caused river traffic problems and occasionally contributed to loss of property and life.

Currently, all locks below Chickamauga Dam are a standard 110 x 600 feet or larger size. At Chickamauga Lock, however, the lock is 60 x 360 feet. Chickamauga Lock, therefore, becomes a bottleneck for all upstream river traffic.

River navigation has increased over time with the construction of the lock and dam network on the river system, as well as local barge loading facilities. River navigation is currently limited due to the small size of the lock, which can only accommodate one jumbo or supertanker barge at a time.

In addition, due to the long-term unreliability of the lock, business development is reluctant to locate new facilities or infrastructure above Chickamauga Lock and Dam. Some goods have shifted to alternative modes of transportation.

Stresses impacting river navigation include economic demands for commodities and delays at some locks. At Chickamauga Lock in particular, locking times can be significant. Future conditions are predicted to be similar to the baseline with an increase in demand over time.

River navigation is important to the regional economy of the eastern Tennessee area as well as the Nation as a whole. Closure of the lock would sever more than 300 miles of inland navigation; about a third of the entire Tennessee River System. Simply replacing the lock in kind would only maintain the status quo; it would hinder any future growth of the system. Replacement with either a 75 x 400 foot or a 110 x 600 foot lock would allow for an immediate reduction in transportation costs and time, and would contribute to the regional and national economic development and would allow for future growth of the navigation system and industry.

The cumulative impacts of the lock and dam system have had a tremendous impact on the transportation industry. The lock at Chickamauga Lock and Dam plays a significant role in the overall system. Although the lock is important for maintaining the system at current levels, it could play a larger role if it was rebuilt as either a 75 x 400 or 110 x 600 foot size.

2.2.4 Aquatic Resources

The Tennessee River is one of the richest rivers in the world with regard to aquatic biodiversity. These native resources have been severely impacted over the years by changes in land use, the introduction of a variety of point and non-point source pollutants, and changes in the river's hydrology. The present system of dams and locks has changed much of the length of the river from a free-flowing stream into a slower, deeper, series of reservoirs. Many of the native aquatic organisms were not able to adapt to these changes and have been largely or completely replaced by substantially fewer species capable of living in the modified habitats.

The four miles immediately downstream from Chickamauga Dam have been designated a State mussel sanctuary. Results of surveys conducted 11 years apart indicate that mussels are surviving in this area; however, most of the animals are old and there is little evidence of recent recruitment. In general, mussels once inhabited most of the length of the river but, now, populations survive only in suitable river-like habitats that typically occur in dam tailwaters. These populations are now separated by habitats changed from a riverine to a lacustrine environment. The mussels resources in the Chickamauga Dam tailwater are significant from both a regional (population) and national standpoint (from the presence of Federal listed species).

The construction of dams has altered the sediment bed transport that affects many aquatic resources such as mussels and fish spawning beds. The dams cause sediment and nutrients to accrete in the impounded sections and downstream areas to be swept clean of sediments. Bottom dwelling organisms above the dams suffer from an overabundance of sediment and nutrients, while animals living immediately downstream from the dams are deprived of these elements.

Large tows must make several cuts or breaks in the barges to process them through the lock. The towboats must constantly maneuver from side to side as well as in line with the channel. Although the wash from the tows is fairly insignificant when aligned with the

channel, when the tows must move from side to side the wash can disturb adjacent mussel beds. The more cuts required, the greater the disturbance. Other tows that wait their turn often toe into the bank. This disturbs or physically disrupts the mussel beds they pass over (or in some cases grind over) and also damages the terrestrial vegetation at the point of impact. For these reasons, larger locks are preferable to smaller ones.

Although the mussels would be minimally disturbed by the construction of a new lock, after the entire project is complete, the impacts to the mussels could be beneficial over present conditions. Minimizing or preventing the need to breakup barge configurations would significantly reduce prop wash and the need for bank toe in by waiting barges.

Fisheries in the area support both a commercial and a recreational fishery. Both are described in the 1996 FEIS as among the most productive in Tennessee and appear to be relatively stable. Nevertheless, fisheries and fish habitat conditions have been stressed over the years by the change from a free-flowing riverine system to a regulated water release program. Although the present resources appear to have adjusted somewhat to modified habitat conditions, migratory fish species appear to find it more difficult, though not impossible, to reproduce in the series of reservoirs. Migratory fish are generally blocked from passage to potential spawning sites upstream by the dam. Presently, the only upstream passage available for the migratory fish is through Chickamauga Lock. If the lock were closed, fish populations would be limited to those presently in the reservoir pools and those that survive the downstream transit over the spillway or through the generators. Closure of Chickamauga Lock would further strain an already artificial ecology. Fish and other organisms that can transit the dams to different pools have a more diverse gene pool and consequently they are usually healthier than isolated populations. Properly designed, however, a new lock could actually enhance the fish's present ability to migrate both upstream and downstream.

Individually many factors may not play a very significant role on aquatic resources, but when added together they have had a profound cumulative effect. Chickamauga Lock and Dam has contributed significantly to these impacts over the years. The impact of replacing the lock, however, would have only a minor effect on the overall system, and could actually provide some enhancements.

2.2.5 Air Quality

Short-term air quality impacts could result from burning debris, dust, and equipment exhaust, however, these impacts would tend to be localized. Long-term impacts will be more regional in scope.

Long locking times increase transportation costs and can force a shift to the alternative modes. The alternative modes, i.e., truck and rail, may be less expensive for shipping costs in the short run, but they also add considerably to fuel consumption and air pollution.

Regulatory programs set standards to protect air quality criteria. Although the Chattanooga area has been a non-attainment area in the past, it is now, as is all of Tennessee, an attainment area. The entire system of navigation locks on the Tennessee and Cumberland Rivers has contributed to this by reducing the number of trucks and trains, and thereby the amount of fuel, necessary to ship goods from one area to another.

Man has had a significant cumulative impact on air quality in the region. The lock and dam system has made shipping large quantities of materials much more effective and has therefore contributed to the overall reduction of the cumulative negative impacts to air quality.

2.2.6 Threatened and Endangered Species

2.2.6.1 Endangered Mussels

As described in Aquatic Resources above, the Tennessee River is one of the richest rivers in the world with regard to aquatic biodiversity. These native resources have been severely impacted over the years by changes in land use, the introduction of a variety of point and non-point source pollutants, and changes in the river's hydrology. The present system of dams and locks has changed much of the length of the river from a free-flowing stream into a slower, deeper, series of reservoirs. Many of the native aquatic organisms were not able to adapt to these changes and have been largely or completely replaced by substantially fewer species capable of living in the modified habitats.

One Federally listed endangered mussel species has been found in the project area. The pink mucket (*Lampsilis abrupta*) is a mussel found in low numbers at a number of locations throughout its range and a few individuals of this species have been found in the mussel bed along the right shore of the river where the approach channel is proposed to be widened. Other endangered mussel species might still occur in the project area; however, none have been found during any recent survey in the area. These endangered mussel species are significant from both a regional (population) and national standpoint (from the presence of Federal listed species).

The river system was much different prior to the construction of the dam. Riverine habitats were converted to lacustrine habitats throughout the length of the mainstem Tennessee River. In addition, the aquatic habitat conditions have been stressed over the years by the change from a free-flowing riverine system to a regulated flow system. The construction of dams has altered the sediment bed transport that affects many aquatic resources such as the endangered mussels. Mussel populations are particularly vulnerable because of their sedentary life style. Many mussel species require specific flow conditions and are adapted to a riverine environment. Some river-dwelling species now survive only in the tailwaters. In addition, the dams allow sediment and nutrients to accrete in the impounded sections. Bottom dwelling organisms living upstream from the dams must contend with an overabundance of sediment and nutrients while organisms living just downstream from the dams must contend with extremely low levels of these elements. This can be detrimental both to the benthic organisms that are inundated and

smothered by the accretions, and to the organisms downstream that are deprived of their benefit. Both point-source and nonpoint-source contaminants, particularly large amounts of sediment from construction, agriculture, and poor land management techniques, contribute to the accretion and to the nutrient loading.

Large tows must make several cuts or breaks in the barges to process them through the lock. The towboats must constantly maneuver from side to side as well as in line with the channel. Although the wash from the tows is fairly insignificant when aligned with the channel, when the tows must move from side to side the wash can disturb the adjacent mussel beds. The more cuts required, the greater the disturbance. Other tows that wait their turn often toe into the bank. This disturbs the mussel beds they pass over (or in some cases grind over) and also damages the terrestrial vegetation at the point of impact. For these reasons, larger locks are preferable to smaller ones.

A detailed biological assessment has been completed and is included in this document. Under Section 7 of the 1973 Endangered Species Act, the Corps and TVA have initiated formal consultation with the FWS. All of the mussels in areas that would be disturbed by the construction would be collected by divers and relocated. Other mitigation measures might be included in the Biological Opinion to be issued by the FWS.

Many factors have impacted the endangered mussels and together they have brought some of these species to the verge of extinction. Chickamauga Lock and Dam, when it was built more than 60 years ago, undoubtedly contributed to these negative impacts. Construction of a new lock, however, would have an insignificant impact overall, and when complete may provide some positive benefits that would help offset past negative effects. Minimizing or preventing the need to breakup barge configurations would significantly reduce prop wash and the need for bank toe in by waiting barges.

2.2.6.2 Mountain Skullcap

Mountain skullcap (*Scutellaria montana*), is a federally threatened member of the mint family. It occupies areas of suitable habitat on the Big Ridge Habitat Protection Area located immediately adjacent to the TVA site designated for disposal of excavated material generated by lock construction. This herb requires shade provided by an intact forest canopy and is especially sensitive to encroachment from weed species when the forest canopy is removed. Individuals of this species are known to occur within 150 feet of the proposed spoil disposal site.

The Mountain skullcap, although Federally listed as threatened, is known at several other sites besides the one adjacent to the lock. This population is, in fact, one of the smaller known communities. Nevertheless, as a part of the construction process, not only would the entire site be preserved intact, but an additional protective buffer would be provided to ensure it remains undisturbed. The species would be completely avoided and therefore, no other mitigation would be required.

2.2.7 Cultural and Historic Resources.

The Chickamauga Lock and Dam complex is an eligible historic property under the National Register of Historic Places. The Norfolk Southern Railroad bridge is a potentially eligible National Register property. Both would either be significantly altered, or have its visual context changed, by project implementation of any of the alternatives.

The existing lock would eventually be closed under any of the alternatives. Construction of a new lock would obviously change the appearance of the dam. The new lock guide walls would extend under and beyond the bridge, thereby altering the surrounding view of the bridge. In addition, at least one of the support piers of the bridge would be surrounded or wrapped by metal sheet pilings to protect it from inadvertent collisions by barges, further altering the historic appearance of the bridge.

Resulting work will adversely affect properties that are eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation is being notified and the Tennessee State Historic Preservation Officer (SHPO) is being consulted to determine how such adverse effects can be taken into account by avoidance, minimization, or mitigation. The adverse effects will be taken into account by stipulation within a Memorandum of Agreement.

2.3 Unavoidable Adverse Effects All of the alternatives including the No Action alternative will have an adverse impact on the historic context of the existing lock. The new lock alternatives would have similar adverse impacts for such features as the disposal area, the excavation required for a new but temporary approach to the existing lock, and historic resources. Negative short-term impacts are construction related. Potential fish kills and loss of riparian habitat from blasting would be realized for all of the new lock alternatives.

2.4 Mitigation Measures When designing a project, negative environmental impacts are to be avoided wherever and whenever possible. Where negative impacts cannot be avoided, they must be minimized. Compensation must be made for impacts that can be neither avoided nor minimized.

Several environmental design features have been built into the three construct new lock designs. These features would allow significant foreseeable impacts to be either avoided completely or to be minimized. In fact, some features may, in the long run, actually enhance the environment over present project conditions. These environmental design features include:

- All mussels within the temporary lock approach channel that must be dredged would be collected and relocated to unaffected areas within the state-designated mollusk sanctuary. This probably would include individuals of at least one endangered species.
- The terrestrial areas that are disturbed during the construction process will be replanted or reforested, and so, long-term losses will be minimized.

- To the extent practicable, the riverbank will be bioengineered to restore the riverine habitat. Due to fast current conditions, lower portions may be riprapped to prevent erosion.
- Studies since the original lock was constructed have shown that different valve designs may improve opportunities for migratory fish to move upstream. These improved designs would be incorporated into the new lock design as an environmental design feature. This would be an improvement over the existing lock.
- One threatened species of plant, the mountain skullcap, has been found at a site adjacent to the proposed project area. This area would be completely avoided including a 250-foot surrounding buffer.

Construction Best Management Plans (BMPs) and using coffer dams or other means to work in the dry to prevent stirring the substrate and contributing to the sediment load would be incorporated in the construction specifications. Through these environmental design features all foreseeable negative impacts would be either avoided or minimized. In some cases the environment may be improved over the long term. No compensatory mitigation, therefore, would be necessary.

2.5 Conclusions

2.5.1 No Action The No Action alternative has a number of negative impacts. No Action would sever 318 miles of the inland waterway, abandon the existing infrastructure, and isolate more than 80 marinas and thousands of pleasure craft from the rest of the river system. It would force intermodal shifts for several commodities to either rail or truck and over the long-term impact air and water quality. No Action would also permanently block passage of migratory fish. The No Action Alternative has no positive benefits or impacts to recommend it.

2.5.2 Construct New 110 x 600 Foot Lock Alternative Initially this alternative would have several negative impacts. These include temporary and minor impacts to water quality, upland vegetation and wildlife, air quality, noise, and aquatic resources. In the long run, however, the 110 x 600 foot lock provides the greatest benefits to shipper costs, river traffic and infrastructure, intermodal shifts and is the Environmentally preferred plan. It would provide the greatest environmental benefits, particularly in the areas of water and air quality, aquatic resources, and noise prevention.

2.5.3 Construct New 75 x 400 Foot Lock Alternative Like the 110 x 600 foot lock, the 75 x 400 foot lock would have some short term, minor adverse impacts to the environment. Over the long term, however, it would provide many benefits. The 75 x 400 foot lock would improve air and water quality, aquatic resources, and noise, shipper costs, river traffic and infrastructure, intermodal shifts, and would have greater NED benefits than any of the other alternatives. Collectively, however, the environmental benefits would not be as great as those provided by the 110 x 600 foot lock.

2.5.4 Construct New 60 x 360 Foot Lock Alternative Constructing a new 60 x 360 foot lock would also have all of the short term, minor adverse impacts that the 110 x 600 foot

lock would cause but, in the long term would provide far fewer benefits. It would have some positive NED benefits, shipper costs, river traffic and infrastructure benefits. This alternative also would provide some positive but minor benefits to air quality and aquatic resources, but would have no impact on noise or water quality. Overall, it would be preferable to the No Action alternative, but would provide far fewer benefits than either the 75 x 400 foot lock or the 110 x 600 foot lock.

2.5.5 NED Plan Analysis by the Corps has determined that the 75 x 400 foot lock is the National Economic Development Plan (NED Plan). Construction of a new 75 x 400 foot lock is estimated to cost $239.4 million. Engineering Regulation 1105-2-100 defines the NED as "Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expresses in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed." By a slight margin the 75 x 400 foot lock is the NED Plan. The Corps' Principles and Guidelines states that "The recommended plan must provide the maximum net NED benefits, that the NED plan must be the selected plan unless there is some overriding reason for selecting another plan, and that the recommended plan must have incremental benefits in excess of incremental costs (a positive incremental cost reduction when compared to the without-project condition)." The computation methods of the NED do not allow inclusion of some considerations such as preferable environmental aspects unless a specific dollar value can be applied. The 75 x 400 foot lock is, therefore, the Corps' recommended plan.

2.5.6 Environmentally Preferred Plan Over the long term, the 110 x 600 foot lock provides the greatest benefits to air quality, noise, safety, and aquatic resources. When river traffic is able to reliably transport larger quantities of goods, fewer numbers of trucks and railroads are required. That translates into improvements in air quality and less noise.

A larger lock will require fewer cuts or breaks of the tows. Little damage is done by a tow as long as it is moving in line with the channel. When the tow is cut, however, the towboat must maneuver side to side. The prop wash that is directed to the side disturbs the bottom and suspends sediment with adverse effects to water quality and to aquatic life. Further, many tows toe into the banks for both the cutting operations and while waiting for other tows to clear the lock. Toeing into the bank also negatively affects the water quality and aquatic life and erodes the bank and littoral zone. The 110 x 600 foot lock requires fewer breaks or cuts than the 75 x 400 foot lock. For that reason the 110 x 600 foot lock is preferable to the 75 x 400 foot lock which maximizes safety for the barge operators. In addition, the 110 x 600 foot lock provides the greatest benefits for shipper costs, river traffic and infrastructure, and intermodal shifts.

The 110 x 600 foot lock is, therefore, considered the environmentally preferred plan. All of these topics are discussed elsewhere in this document.

2.6 Environmental Justice Executive Order 12898 requires that extensive outreach and opportunity for involvement will address concerns of all communities and that minority residents and low-income residents receive fair and equitable consideration for any potential adverse health and environmental effects from proposed actions. All of the work would take place on TVA property or on property leased for the purpose. This was discussed in Section 5.4 of the 1996 FEIS. The TVA analysis concluded that there were no disproportionate effects on minority or low-income populations. No substantial changes in this information are known to have occurred during the last six years.

2.7 National Defense / Homeland Security Maintaining navigation and enhancing transport capacity could prove crucial in the area of National Defense. Without a lock at Chickamauga, the upper Tennessee River including the industrial capacity in the Knoxville area and Oak Ridge would be isolated. Further, rail transport is vulnerable because of the three bridge crossings over the Tennessee River. A terrorist attack against one or more of the bridges could put a severe strain on the regions ability to ship coal and other commodities to the south and west. A 110 x 600 foot lock would be better able to handle a sudden increase in traffic in the event of an emergency than a 75 x 400 foot lock.

Table 1
Comparison of Impacts

	Close Lock	60 x 360 Lock	75 x 400 Lock	110 x 600 Lock
Socioeconomics Overall	- - -	+	+ + +	+ + +
NED Benefits	- - -	+	+ + +	+ +
Shipper Costs	- - -	+	+ +	+ + +
River Traffic & Infrastructure	- -	+	+ +	+ + +
Intermodal Shifts	- -	+	+ +	+ + +
Recreation	-	+	+	+
Land Use	=	=	=	=
Water Quality – Short Term	=	-	-	-
Water Quality – Long Term	=	=	+	+ +
Air Quality – Short Term	-	-	-	-
Air Quality – Long Term	--	+	+ +	+ + +
Aquatic Resources – Short Term	=	-	-	-
Aquatic Resources – Long Term	-	+	+ +	+ + +
Wetlands	=	=	=	=
Upland Vegetation & Wildlife – Short Term	=	-	-	-
Upland Vegetation & Wildlife – Long Term	=	=	=	=
Threatened & Endangered Species – Long Term	=	=	=	=
Historic and Cultural Resources	-	--	--	--
Noise – Short Term	-	-	-	-
Noise – Long Term	- -	=	+	+ +
Flood Control/Floodplain	=	=	=	=

Note: - equals minor negative impacts, - -equals moderate negative impacts, - - - equals severe negative impacts.
= equals no impact.
+ equals minor positive impacts, + + equals moderate positive impacts, + + + equals major positive impacts.

3.0 Affected Environment

This section describes the physical, biological, social, historic property, and economic resources in the Chickamauga area that could be affected by the proposed action.

3.1 Socioeconomics The Chickamauga Lock project is located in Hamilton County, the center of a metropolitan area. Hamilton County has a relatively high per capita income at $21,204 compared to the Tennessee average of $18,283 in 1990. Strong economic links exist between Hamilton County and its neighboring counties of Bradley, Grundy, Marion, Meigs, Rhea, and Sequatchie in Tennessee; Catoosa, Dade, Walker, and Whitfield in Georgia; and DeKalb and Jackson in Alabama. As a result of these links, the project's income and employment impacts would extend beyond the Chattanooga area to these neighboring counties.

3.2. River Transportation Barge transportation moves certain bulk commodities into and out of the upper Tennessee River area as evidenced by the 2.3 million tons of commodities transported annually through Chickamauga Lock. If moved by overland modes, this material would require 94,000 tractor-trailer loads or 230 trains of 100 cars each.

General characteristics of the river traffic and commodities were presented in Section 3.2 of the 1996 EIS. No substantial changes in this information is known to have occurred during the last six years.

3.3 Recreation

3.3.1 Area Description General recreation characteristics of the Chickamauga and Nickajack reservoirs was presented in Section 3.3 of the 1996 EIS. No substantial changes in these resources is known to have occurred during the last six years.

3.3.2 Recreation Lockages There were a total of 5,023 lockages (a lockage can include more than one vessel) at Chickamauga in 2000. Of the 5,023 lockages, 2,070 were recreational, 2,876 were commercial, and 77 were classified as other. Commercial lockages occur 24 hours per day, seven days per week, and are evenly distributed throughout the year. Eighty-two percent of the total recreation lockages occur on Fridays, Saturdays, and Sundays.

3.4 Land Use Land use of the area was described in Section 3.4 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

3.5 Water Quality Water quality characteristics of the Chickamauga Dam reservoir and tailwater were presented in Section 3.5 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

3.6 Air Quality The air quality in the vicinity of Chickamauga Lock and Dam is generally good. The dam is located in an area that is in attainment or unclassifiable for all state and national ambient air quality standards (NAAQS).

3.7 Aquatic Resources

General characteristics of the aquatic resources in the Chickamauga Dam tailwater were presented in Section 3.71 of the 1996 EIS. No substantial changes in these resources is known to have occurred during the last six years.

Results from a 2001 TVA survey (Fraley, 2001) indicate that no substantial changes have occurred in the composition or abundance of native mussel species present in this tailwater. During this recent survey, 12 native mussel species were found in the area which could be affected by the shoreline dredging associated with this project while 14 native species were found in the same area during a more extensive survey conducted in 1990 (Jenkinson, 1993). The overall density of mussels encountered during these surveys was similar (2.0 mussels per square meter in 1990 and 1.7 in 2001) and the seven most abundant species were the same during both surveys (Fraley, 2001). Very little evidence of recent recruitment among any species was found during either survey. As indicated in the 1996 EIS, the Tennessee Wildlife Resources Agency has designated the four-mile reach between Marine Way Upper Light (TRM 465.9) and Chickamauga Dam as a state mollusk sanctuary.

3.8 Wetlands and Wetland Wildlife The 1996 FEIS identified one wetland at approximately TRM 468.8L (left bank looking downstream from the dam). This wetland would not be affected by the project. The Corps visited the site during preparation of this report and found no changes to the site conditions described in the 1996 FEIS.

3.9 Upland Vegetation and Wildlife General characteristics of the upland vegetation and wildlife were presented in Section 3.9 of the 1996 EIS. No substantial changes in these resources is known to have occurred during the last six years.

3.10 Threatened and Endangered Species

Section 3.10.1 of the 1996 EIS includes a list of 19 federal listed or candidate aquatic endangered or threatened species that once occurred in the Chickamauga Dam tailwater, Chickamauga Reservoir, or the lower Hiwassee River. The U.S. Fish and Wildlife Service no longer maintains an extensive list of species being considered for possible listing and the number of listed aquatic species known to have occurred in the Chickamauga Dam tailwater or in Chickamauga Reservoir now includes 11 species (Table 2). Similar to the information presented in the 1996 EIS, the recent occurrence determinations presented in Table 2 are based on the results of surveys conducted during the last 30 years by federal and state agencies.

Table 2. Federal endangered and threatened species known from the Tennessee River downstream from Chickamauga Dam (TRM 458-471) and within Chickamauga Reservoir (TRM 471-515).

Common Name	Scientific Name	Protection Status	Still Present ? Chickamauga Tailwater	Still Present ? Chickamauga Reservoir
Snail				
Anthony's riversnail	*Athearnia anthonyi*	LE	N?	N
Mussels				
fanshell	*Cyprogenia stegaria*	LE	N?	N
dromedary pearlymussel	*Dromus dromas*	LE	N?	N
tuberculed blossom	*Epioblasma t. torulosa*	LE	N	N
cracking pearlymussel	*Hemistena lata*	LE	N	N
pink mucket	*Lampsilis abrupta (= L. orbiculata)*	LE	Y	N
ring pink	*Obovaria retusa*	LE	N	N
white wartyback	*Plethobasus cicatricosus*	LE	N	N
orange-footed pimpleback	*Plethobasus cooperianus*	LE	N?	N
rough pigtoe	*Pleurobema plenum*	LE	N?	N
Fish				
snail darter	*Percina tanasi*	LT	Y	N?

Abbreviations:

LE - listed as an endangered species by USFWS.
LT - listed as a threatened species by USFWS.
N - once found in this area but no longer occurs there.
Y - still occurs in this area.
? - this is the likely status; however, insufficient information exists to confirm or refute this opinion.

3.10.1 Aquatic Species Results from a mussel survey completed in 2001 indicate that there has been little change in species or distribution in the last 6 years since the FEIS was completed. A Biological Assessment has been prepared (see Appendix A) and submitted to FWS. FWS has prepared a Coordination Act Report and is preparing a Biological Opinion.

3.10.1.1 Chickamauga Tailwater As indicated in Table 2, one federal endangered species and one federal threatened species are known to persist in the Chickamauga Dam tailwater area. The endangered species, the pink mucket *(Lampsilis abrupt*a), was found at four sites between TRMs 468.6 and 470.4 during the survey conducted in 1990 (Jenkinson, 1993); however, it was not encountered during the survey conducted in part

of the same area in 2001 (Fraley, 2001). The threatened species, the snail darter *(Percina tanas*i), occurs in South Chickamauga Creek and is known to drift downstream into the Tennessee River. Four snail darters were seen in the river near TRM 468.2 in 1980 (Biggins and Eager, 1983).

There is somewhat less likelihood that five other protected species still exist in the Chickamauga Dam tailwater. No specimens of Anthony's riversnail *(Athearnia anthony*i) have been found in this river reach in recent years, but this species still occurs in similar habitats downstream from Nickajack Dam (Gooch et al., 1979; Jenkinson, 1994). A few specimens of each of four mussel species [fanshell *(Cyprogenia stegaria*); dromedary pearlymussel *(Dromus dromas);* orange-footed pimpleback *(Plethobasus cooperianus*); and rough pigtoe *(Pleurobema plenu*m)] have been found in the Watts Bar tailwater (Gooch et al., 1979; Baxter et al., 1998) but none of these species has been found in similar habitats downstream from Chickamauga Dam in recent years. The most recent occurrence of one of these species known from the Chickamauga Dam tailwater was a 1963 record of the orange-footed pimpleback (Herb Athearn collection). This species has not been found in this part of the river during any subsequent survey.

3.10.1.2 Chickamauga Reservoir The information presented in Table 2 indicates that none of the federal listed species are known to persist in the impounded part of Chickamauga Reservoir. While all of these species occurred in this reach of the Tennessee River prior to impoundment, there are no recent records for these species from the reservoir. Suitable habitat for most of these species no longer occurs in this area, and they are quite unlikely to be found there.

The one exception to this generality is the snail darter (Percina tanasi). Snail darters might drift into the more riverine sections of the impoundment; however, these areas would be marginal habitat for the species and only transient individuals are lkely to be present.

3.10.2 Terrestrial Threatened and Endangered Species No populations of federal or state listed plant species or plant species candidates under review for federal or state listing are known to exist on the sites proposed for disturbance. Mountain skullcap (*Scutellaria montana*), a federally threatened member of the mint family, has recently been down-listed from the endangered listing. It occupies areas of suitable habitat on the Big Ridge Habitat Protection Area located immediately adjacent to the TVA site designated for disposal of excavated material generated by lock construction. This herb requires shade provided by an intact forest canopy and is especially sensitive to encroachment from weed species when the forest canopy is removed. Individuals of this species are known to occur within 150 feet of the proposed spoil disposal site.

3.11 Archaeological, Historical, and Cultural Resources Within the Chickamauga Dam region, archaeological sites have been documented from the PaleoIndian (ca. 10,000 - 7500 BC), Archaic (ca. 7500 - 1000 BC), Woodland (ca. AD 900 - 1000), Mississippian (ca. AD 900 - 1540), and historic (post 1540 AD) time periods.

An archaeological survey in 1992 (Fryman and Holland, 1992) determined that project impact areas likely to be impacted by new lock construction were void of intact archaeological deposits. An additional archaeological survey in 1994 (Alexander, 1994) of an area proposed for right bank removal between TRM 470.0 and 470.6 resulted in the delineation of two archaeological sites, 40Ha397 within the first river terrace and 40Ha398 within the second river terrace. Site 40Ha397 was not considered eligible for listing in the National Register of Historic Places; site 40Ha398 was not sufficiently investigated to determine eligibility for listing on the National Register.

The only historic property, located within or adjacent to the project site, that has been determined eligible for listing on the National Register of Historic Places is the Chickamauga Lock and Dam complex. The Norfolk and Southern Railroad bridge, located immediately downstream of the project, is considered potentially eligible for listing on the National Register pending additional evaluation.

Resulting work will adversely affect properties that are eligible for listing in the National Register of Historic Places.

3.12 Noise The area around the lock can be generally described as urban with most of the noise coming from traffic crossing the SR 153 overpass. The closest receptor is a multiresident housing complex located near the river's edge approximately one-half mile upstream from the lock. Existing Day-Night Average Sound level (L_{dn}) for general urban areas is estimated to be in the range of 55-65 decibels (National Academy of Sciences, 1977).

3.13 Flood Control/Floodplains The 100-year floodplain for the Tennessee River varies from elevation 658.5 at mile 466.8 to elevation 686.0 immediately upstream of Chickamauga Dam. The TVA Flood Risk Profile elevations on the Tennessee River vary from elevation 665.0 at mile 466.8 to elevation 689.0 immediately upstream of Chickamauga Dam. The TVA Flood Risk Profile is used to control flood damageable development on TVA lands. For North Chickamauga Creek the 100-year floodplain is the area lying below elevation 659.9, and the 500-year floodplain is the area lying below elevation 666.3.

Chattanooga, Tennessee, has adopted the 100-year flood as the basis for its floodplain regulations, and any development would be consistent with these regulations. For this project area, the floodways adopted by the city of Chattanooga are those portions of the Tennessee River and North Chickamauga Creek channels and floodplains that must remain open and unobstructed to allow passage of floodwaters in order to prevent any substantial increase in upstream flood elevations.

4.0 Environmental Consequences

This section describes the potential impacts on the environmental resources of the project area for the No Action alternative and the alternatives of constructing a 60 x 360 foot lock, or a 75 x 400 foot lock, or a 110 x 600 foot lock. The only substantial additions or changes to the 1996 FEIS are in the sections dealing with cumulative effects, Threatened and Endangered Species, and cultural and historic properties, although where possible new data has been substituted for old data.

4.1 Socioeconomic These impacts are described in detail in Section 4.1 of the 1996 EIS. Additional information may be found in the Chickamauga Lock Feasibility Study dated February 2002.

4.1.1 Construct New Lock If a new lock (110 X 600, 60 X 360, or 75 X 400) is constructed at Chickamauga Dam adjacent to the existing lock, the existing lock would be taken out of service and plugged with concrete. Positive economic and social impacts would occur in the general area of the project during construction and in the upper Tennessee River region during operation of the facility. Similar socioeconomic impacts would apply to all three lock sizes, including employment and income changes.

The No Action plan would provide a few jobs for a brief period while the concrete plug was being installed. It would not provide any significant benefits such as those listed above.

4.1.2 Operational Phase If a new lock were constructed at Chickamauga Dam, survey data indicates that barge traffic on the Tennessee River would grow from today's 2.3 to 7.6 million tons annually in the year 2010 in an unconstrained system. The 5.3 million tons difference between the 2.3 and 7.6 million tons is primarily from potential traffic that would be attracted to barge transportation from other transportation modes. Indirect impacts of building a new lock at Chickamauga include the shifting of a considerable amount of tonnage presently moving via overland routes to the safe and more fuel-efficient barge mode. The impact of this production increase was not addressed in the 1996 FEIS, nor is it addressed in this document, because any prediction of such production increases would have been speculative.

4.1.3 National Economic Development Benefits A replacement lock at Chickamauga contributes to the National Economic Development (NED) in varying ways. NED navigation benefits consist of reductions in transportation costs for existing traffic moving on the waterway and for traffic moved to the waterway because of shifts in modes of transportation because of the elimination of the reliability problems with the existing lock and through reduced waterway costs. Other NED benefits include reduction in repair costs associated with AAR, reduction in external costs resulting from both scheduled and unscheduled lock closures, elimination of helper boats at Chickamauga, and improvements in recreation benefits.

4.1.4 No Action Alternative In the no action alternative the lock at Chickamauga would be monitored until it was determined to be no longer safe. At that time it would be plugged, and upstream navigation on the Tennessee River would end at Chickamauga Dam. Closing the Chickamauga Lock would thus decrease the nation's navigable waterways by 318 miles.

The economic impacts of closing Chickamauga Lock would drastically affect the upper east Tennessee area. The impacts would include (1) closure of barge terminals, (2) increased production costs for area industry and government with the possible closure of some firms, (3) diversion of traffic to overland routes with increased pollution and accident rates, (4) national energy and security impacts by isolating the Oak Ridge, Tennessee, projects from barge traffic, (5) higher shipper cost due to elimination of the least cost and competitive alternative, and (6) the negative impact on riverfront development and recreational boating. Closure of Chickamauga Lock would be in effect abandoning the existing navigation facilities at Watts Bar, Ft. Loudoun, and Melton Hill Locks.

If Chickamauga Lock was not available for commercial navigation (No Action Plan), each producing or shipping company would be faced with selecting from two alternatives. Some would shift from barge to overland transportation. However, due to higher transportation costs, others would be forced to cease operations.

4.2 River Traffic, Infrastructure, and the Effects of Modal Shifts The effects of improving the lock at Chickamauga are discussed in Section 4.2 of the 1996 EIS. In addition, the economics and impacts have been thoroughly described in the Chickamauga Lock Feasibility Study dated December 2002.

About 2.3 million tons of traffic are locked through Chickamauga Dam annually, and the survey data has indicated that an additional 5.2 million tons would be diverted from the roadway to the lock if a new lock were constructed there. Shifting 5.2 million tons of potential traffic to the new lock could result in environmental benefits.

4.3 Recreation Impacts to recreation were described in Section 4.3 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

4.4 Land Use Impacts to recreation were described in Section 4.4 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

4.5 Water Quality Impacts to recreation were described in Section 4.5 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

4.6 Air Quality Impacts to recreation were described in Section 4.3 of the 1996 EIS. No substantial changes are known to have occurred during the last six years. Construction of either a 110 x 600 or a 75 x 400 foot lock would assist in meeting the goals of the Clean Air Act Conformity Rule. In contrast, closing the lock as described in the No Action alternative would result in a corresponding increase of SO_x and NO_x emissions, and would work against meeting the goals of the Clean Air Act Conformity Rule.

4.7 Aquatic Resources

4.7.1 Construct New Lock Alternatives In general, the construction and operational effects of building a new Chickamauga lock on aquatic resources remain as described in Section 4.7 of the 1996 FEIS. The plankton community would not be affected because of the transient nature of plankton populations in the tailwater area. Any short-term increase in turbidity associated with lock construction would have little or no adverse impact on submersed aquatic macrophytes. Lock construction and channel dredging would have only local and temporary impacts on the fish community. Sport and commercial fishing in the immediate construction area would be disrupted during the construction phase of the project; however, fishing should return to previous levels soon after construction is completed.

Based on information collected during the 1990 and 2001 mussel surveys in the Chickamauga Dam tailwater (Jenkinson, 1993; Fraley, 2001), the location, composition, and density of the mussel bed has not changed very much during the last eleven years. Most of the mussels found in this area during both surveys were representatives of two species (elephantear, *Elliptio crassidens*, and pink heelsplitter, *Potamilus alatus*). Both of these species are widespread throughout the Tennessee and Mississippi River basins, and neither is protected as an endangered or threatened species by the federal or Tennessee state government. Very little evidence of recent recruitment in any surviving species was observed during either of these surveys.

Dredging to provide access to the new lock has the potential to affect resident mussel stocks. The 1990 and 2001 mussel surveys (Jenkinson, 1993; Fraley, 2001) specifically included searches of the areas where lock construction or approach channel dredging would take place. Results from those surveys indicate that few mussels occur within the lock construction area, and only a few more occur where the downstream approach wall is proposed to be built. A fairly abundant and diverse mussel assemblage occurs along the right (descending) shoreline from TRM 469.4 to 470.7 and extends from the bank out to the edge of the present navigation channel. In this area, mussels average

approximately six live animals per square meter; however even here, there was little evidence of recent recruitment. Dredging is now proposed to occur only in the part of this area between TRM 470.0 and 470.6. Resident mussels would be removed from the proposed dredge area and would be relocated to other suitable mussel habitat in the Chickamauga Dam tailwater before the dredging occurred.

Hickman et al. (1989) and St. John (1990) found that sauger do not spawn in the area immediately below either Watts Bar or Ft. Loudoun Dams, but at the first downstream gravel shoal area (approximately five to ten river miles below the dam). It is anticipated that a similar condition exists below Chickamauga Dam, with spawning most likely occurring at Williams Island (15 river miles downstream). It is possible the spawning site in upper Chickamauga Reservoir is the location where Nickajack sauger spawn. In either case, excavation of dredge material in the vicinity of the lock approach modification site would not adversely impact sauger spawning success.

After a new lock was built, operation of the project would not be anticipated to have any effect on mussel resources in the Chickamauga Dam tailwater or reservoir. Mussels in the tailwater that were not impacted by construction would not be affected by minor changes in flow or navigation traffic and would continue to exist as they did before the project was started.

Operation of a new lock is unlikely to have any substantial impact on most fish species in the Chickamauga Dam tailwater or reservoir. However, depending upon its design, the new lock could have important effects on migratory species, particularly sauger. Scott and Hevel (1993) evaluated results from several studies to show that sauger are able to move easily through some locks but not others. Location and configuration of the downstream discharge ports appear to be the important difference between various lock designs as they affect fish passage. Discharge structures located near the river bottom in areas with substantial current apparently attract sauger into a lock. These features would be incorporated in the design of a new Chickamauga Lock. These features would facilitate upstream sauger movements and, perhaps, augment sauger populations both downstream and upstream of Chickamauga Dam. Other migratory species may also benefit by gaining access to spawning areas above Chickamauga Dam.

Very little sediment in Chickamauga tailwater or Chickamauga Reservoir would be resuspended by increased barge traffic (Bender and Proctor, 1992). Even if resuspension were to occur, the extremely low levels of metals in the sediments would not have a detectable effect on water quality or aquatic life. No PCBs, cancer causing organic constituents, or radioactive materials were found and the sediment quality is generally rated as good.

4.7.2 No Action Alternative Plugging the existing lock would have minimal impacts on most aquatic life in Chickamauga Reservoir and the dam tailwater. Plugging the lock would, however, create a barrier for migratory fish species such as sauger, white bass, buffaloes, and redhorses. This option would prevent migration of fish from Nickajack Reservoir to upstream spawning areas in Chickamauga Reservoir. If these species were prevented from reaching Chickamauga Reservoir, they probably would attempt to spawn

in Nickajack Reservoir, which is considered less favorable for spawning success than Chickamauga Reservoir. Downstream movement of fish from Chickamauga Reservoir could still occur during periods of high flow when the dam spillway gates are opened and through the turbines during periods of hydro-generation.

Adoption of the no action alternative would not include any way to build structural features to assist fish in their upstream migrations. Nonstructural mitigation measures could possibly be implemented, such as stocking programs and, potentially, tailwater habitat enhancements.

4.8 Wetlands and Wetland Wildlife The only wetlands identified in the vicinity of Chickamauga Dam project are on the left bank shoreline (TRMs 468.8L to 469.4L on Nickajack Reservoir). These wetlands were identified during preliminary field inspections and classified and mapped using the classification system of Cowardin, et al. (1979). No dredging activities would occur within this river reach. Therefore, no direct or indirect impact to wetlands is expected from any of the alternatives.

4.9 Upland Vegetation and Wildlife Impacts to recreation were described in Section 4.9 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

4.10 Threatened and Endangered Species None of the four alternatives would have adverse effects on the federally protected species present in the project area. The Mountain skullcap would be avoided by establishing a 250-foot forested buffer to protect it from potential impacts at the disposal site. Snail darters in the Tennessee River downstream from Chickamauga Dam would be affected very little by the minor and localized increases in turbidity and bed load material caused by the construction activities. Any snail darters in the area would avoid the active work sites during substrate disturbance, after which they would resume their normal activities.

Some pink mucket *(Lampsilis abrupt*a) specimens are likely to occur in the area where dredging would be used to establish part of the new approach channel. The possibility also exists that a very few individuals of other endangered mussel species could be present in the proposed dredging area. Moving resident mussels out of the construction area and relocating them to other suitable habitats in the mollusk sanctuary downstream from Chickamauga Dam would avoid potential impacts to these individuals. The FWS has prepared a Coordination Act Report for this project that addresses potential effects on the endangered and other resident species. The Corps and TVA also have initiated Formal Consultation with the FWS under the Endangered Species Act to ensure there would be no adverse effects to any federal endangered or threatened species. At the conclusion of this consultation, the FWS would issue a Biological Opinion about the project and indicate any additional measures required to avoid adverse effects to federal endangered and threatened species. This consultation must be concluded before a Record of Decision (ROD) on the project can be signed. Any additional mitigation activities would be underway before the dredging work commences.

4.11 Archaeological, Historical, and Cultural Resources Based on record/archival checks and field reconnaissance, no historic properties (archeological sites) were found in the existing lock parking area and the proposed disposal site on TVA property adjacent to the North Chickamauga Creek Greenway that would be affected by construction of any of the alternatives being considered. Shoreline disposal of dredge material at Nickajack Reservoir (TRM 468.8R) would also not affect historic properties.

The upper portion of the Dupont construction laydown area contains undisturbed soil strata and may contain archeological deposits in buried contexts. Archeological survey of this area will be required prior to use.

A small strip of shoreline from TRM 470.1R to TRM 470.8R would be acquired and subsequently removed. Archeological survey in this location resulted in the identification of two archeological sites, 40Ha397 and 40Ha398. Site 40Ha397 is located on the first, or Holocene, terrace immediately adjacent to the river within the strip of land scheduled for removal. Site 40Ha397 is not considered eligible for listing in the National Register of Historic Places and does not warrant additional archeological investigation. Although additional investigation is not warranted, the site, like many similar archeological deposits along the Tennessee River, may contain isolated late prehistoric burials and will require archeological monitoring during bank removal.

Site 40Ha398 is located on the second, or Pleistocene, river terrace approximately 150 meters north of the Tennessee River outside of the area proposed for bank removal. Although survey indicated that site 40Ha398 is primarily confined to the plowzone, several recovered artifacts indicate that subsurface features may be intrusive into sub-plowzone deposits. The National Register eligibility of 40Ha398 has not been determined; however, potential impacts to 40Ha398 can be avoided either by not using or crossing the site or by buffering vehicular traffic across it. If avoidance or buffering is not feasible additional archeological investigation of the site context will be required to determine its eligibility and to define appropriate mitigation requirements.

All proposed alternatives will have an adverse effect on the Chickamauga Lock and Dam complex, a property that has been determined eligible for listing in the National Register of Historic Places.

All of the construct new lock alternatives include a downstream approach wall that would extend beyond the Norfolk and Southern Railroad bridge. In addition, at least one of the support piers of the bridge would be surrounded or wrapped by metal sheet pilings to protect it from inadvertent collisions by barges. The National Register eligibility of the bridge has not been evaluated. Although the actual structure of the bridge will not be directly affected by the approach wall construction, the visual context of the bridge will be affected. An evaluation of the National Register eligibility of the bridge and an assessment of adverse effect will be required before a Record of Decision can be signed.

Resulting work will adversely affect properties that are eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation has been notified and the Tennessee State Historic Preservation Officer (SHPO) is being consulted to determine how such adverse effects can be taken into account by avoidance, minimization, or mitigation. Due to the presence of prehistoric archaeological remains, consultation with Native American Tribes has been initiated. In accordance with requirements at 36CRF § 800.6, the Corps of Engineers proposes to address the adverse effects of lock replacement within the context of a Memorandum of Agreement (MOA) amongst the Corps of Engineers, the Tennessee Valley Authority, and the Tennessee State Historic Preservation Officer. The MOA will stipulate 1) measures that will be implemented to avoid, minimize, or mitigate potential adverse effects on historic properties including the Chickamauga Lock and Dam complex and other potential historic properties, including archeological sites, 2) requirements for additional archeological survey and testing, and 3) requirements for archeological monitoring during certain aspects of construction.

4.12 Noise Noise impacts described in Section 4.12 of the 1996 EIS. No substantial changes are known to have occurred during the last six years.

4.13 Flood Control/Floodplain Impacts to the flood plain and flood control were described in Section 4.13 of the 1996 EIS. None of the alternatives would affects a 100 year flood (1% probability event). No substantial changes are known to have occurred during the last six years.

4.14 Cumulative Effects Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the (proposed) action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7)". Council for Environmental Quality (CEQ) guidance identifies an 11-step process for evaluating cumulative effects. For the purposes of cumulative effects the entire Chickamauga Lock project is considered, not just the supplemental information provided in this FSEIS.

The assessment can be defined as "what resource goals is the proposed action going to affect". Effects can result from either direct-project related, indirect-project related, and independent indirect causes. Based on the public and agency scoping and review performed for the previous NEPA documents conducted for this project, the following resources have been identified as target resources within the assessment goals: socioeconomics, recreation/tourism, river navigation, aquatic resources, air quality, threatened and endangered species, and cultural and historic resources.

4.14.1 Socioeconomics. Socioeconomics impacts are regional in scope. For the purposes of this assessment, the entire upper end of the Tennessee River system was considered. Past impacts will be considered from early European settlement. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

The river system was much different prior to the construction of the dam. Native Americans and European settlers used the river to move trade goods in canoes, rafts, small boats, and later by steamboat. The Chattanooga City area was a recognized antebellum industrial complex and included a blast furnace for iron, a teeming waterfront, railroads, a distillery, and mills. River navigation increased over time; particularly with the construction of the lock and dam and the local barge loading facilities. Largely as a result of the river and its cheap transportation, the region grew and prospered.

Socioeconomics in the region have been steady with gradual growth around the Chattanooga area and recreational second homes are being built in the area of the lakes. Today Chattanooga has a diverse economy that includes manufacturing, services, agriculture, transportation, finance, and construction.

River navigation, and therefore, to a degree, the regional growth and prosperity is currently limited due to the small size of the lock, which can only accommodate one jumbo or supertanker barge at a time. Longer delays result in additional costs and in time and fuel for tugs. The movement of a 12-barge group results in 12 individual lockages. The cost of breaking and reforming the tow costs time and fuel. Repetitive lockings also increase the likelihood of accidents around the lock. As delays increase, more river traffic shifts to alternative rail and road transportation. The project impact area is affected by a variety of inter-related factors such as upstream land use changes, population trends and resulting point and non-point pollution loads. Socioeconomic conditions include the demand for products transported by the river system and transportation costs for river traffic versus alternative modes of transport. Long locking times increase transportation costs and can force a shift to the alternative modes.

In addition, due to the long-term unreliability of the lock, business development is reluctant to locate new facilities or infrastructure above Chickamauga Lock and Dam. Some goods have been forced to shift to alternative modes of transportation. The alternative modes, i.e., truck and rail, may be less time consuming and less expensive for shipping costs in the short run, but they also add considerably to fuel consumption, road congestion and degradation, accidents including injuries and fatalities, and air pollution.

Like most cities in the southeastern United States, the City of Chattanooga continues to grow. This urban and suburban growth constantly encroaches upon all resources. Future conditions will be similar to the baseline with an increase in population of the region. River navigation will gradually increase over time.

River navigation is important to the regional economy of the eastern Tennessee area as well as the Nation as a whole. Closure of the lock would sever more than 300 miles of inland navigation, about a third of the entire Tennessee River System. Simply replacing the lock in kind would only maintain the status quo. It would hinder, but not eliminate future growth in either the navigation system or the region. Replacement with either a 75 x 400 foot or a 110 x 600 foot lock would result in an immediate reduction in transportation costs. This saving due to reduction in time and fuel consumption due to

fewer lockages would contribute to the regional and national economic development, and would facilitate future growth of the navigation system and industry.

Chickamauga Lock has contributed significantly to the socioeconomics of the region. Cumulatively it plays an important role in the economics of the region and directly and indirectly impacts such diverse factors as job and population distribution, recreation, housing, industry and more. Although the lock is important for maintaining the status quo, it could play a larger role if it was rebuilt as either a 75 x 400 or 110 x 600 foot size. Economic models do not predict any runaway growth or development from this lock, although it is expected to contribute to the overall growth of the region.

4.14.2 Recreation/Tourism

Recreation and tourism are closely tied to socioeconomics. The geographic scope for this analysis also includes the upper end of the Tennessee River system. Significant recreation and tourism is a relatively recent phenomenon. Therefore, past impacts will only be considered from just prior to construction of Chickamauga Lock and Dam in 1940. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

Future conditions are expected to be similar to the baseline with an increase over time. Residential development in the areas adjacent to the lakes will likely grow at a faster rate with construction of recreational second-homes.

Recreation quality is affected by the availability of adequate facilities. Long waits for lockage times can detract from the perceived quality and can impact organized events. Recreation resources are generally available but may be less attractive during high use (holiday) periods due to crowding and longer waits. Organized events like the Riverbend Festival and Annual Fall Color Cruise and Folk Festival may take several lockages due to the number of vessels involved. If a commercial tow is also trying to use the lock facilities, both parties may experience considerable waits and could seriously detract from the pleasure of the outing.

Recreation is affected by socioeconomic factors (dollars available to spend), the availability of recreational facilities, and the availability of resources such as a healthy population of game fish. If the lock were to be closed or of such size that it would cause excessive delays, then it would negatively impact the recreation in the area. Likewise, if the lock were closed or made impassible to the migratory fish, then the fishery would be negatively impacted, which would, in turn, negatively affect recreational fishing.

Recreation is also significant to the local economy. More than 80 marinas currently exist above Chickamauga Lock. They service thousands of recreational pleasure craft. Closure of the lock would severely limit the use of the river system by these recreators. Special events like the Riverbend Festival and Annual Fall Color Cruise and Folk Festival contribute many thousands of dollars to the local economy annually. Lock closure would

primarily affect larger boats. Smaller craft could be trailered around the lock if necessary.

The cumulative impacts of the lock and dam system have had an impact on recreation and tourism in Tennessee. Although the lock is not as important to recreation as it is to navigation, closure would curtail some events. As recreation dollars are spent they have a large ripple or cumulative effect in the local economy.

4.14.3 River Navigation

River navigation, for the purpose of this study includes the entire Tennessee River system. River navigation and transportation began in prehistoric times and by the Civil War they were a major industry. Control of the rivers played a key role in the defeat of the Confederacy. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

The river systems were much different prior to the construction of the current system of locks and dams. Shoals and snags frequently caused river traffic problems and occasionally contributed to loss of property and life.

Currently, all locks below Chickamauga Dam are a standard 110 x 600 feet or larger size. At Chickamauga Lock, however, the lock is only 60 x 360 feet. Chickamauga Lock, therefore, becomes a bottleneck for all upstream river traffic.

River navigation has increased over time with the construction of the lock and dam network on the river system, as well as local barge loading facilities. River navigation is currently limited due to the small size of the lock, which can only accommodate one jumbo or supertanker barge at a time. As delays increase, more river traffic shifts to alternative rail and road transportation.

In addition, due to the long-term unreliability of the lock, business development is reluctant to locate new facilities or infrastructure above Chickamauga Lock and Dam. Some goods have been forced to shift to alternative modes of transportation. The alternative modes, i.e., truck and rail, may be less expensive for shipping costs in the short run, but they also add considerably to fuel consumption, road congestion and degradation, accidents including injuries and fatalities, and air pollution.

Stresses impacting river navigation include economic demands for commodities and delays at some locks. At Chickamauga Lock in particular, locking times can be significant. A 15-barge tow typically takes about 16 hours to lock through. Corps policy requires that after every third commercial lock-through, a recreational boater be given priority. Thus, a recreational boater may have to wait up to three hours to pass through the lock. At the same time, if several recreators desire passage a large tow may experience significant delays. Future conditions are predicted to be similar to the baseline with an increase in demand over time.

River navigation is important to the regional economy of the eastern Tennessee area as well as the Nation as a whole. Closure of the lock would sever nearly 300 miles of inland navigation, about a third of the entire Tennessee River System. Simply replacing the lock in kind would only maintain the status quo; it would hinder any future growth of the system. Replacement with either a 75 x 400 foot or a 110 x 600 foot lock would allow for an immediate reduction in transportation costs and time, and would contribute to the regional and national economic development. It would allow for future growth of the navigation system and industry.

The proposed Chickamauga Lock Project would produce significant positive impacts on river navigation. River navigation would be improved by the additional capacity of the new lock.

The cumulative impacts of the lock and dam system have had a tremendous impact on the transportation industry. The lock at Chickamauga Lock and Dam plays a significant role in the overall system. Without the lock roughly a third of the Tennessee River system would be severed from the whole. Although the lock is important for maintaining the system at current levels, it could play a larger role if it was rebuilt as either a 75 x 400 or 110 x 600 foot size.

4.14.4 Aquatic Resources

The Tennessee River is one of the richest rivers in the world with regard to aquatic biodiversity. These native resources have been severely impacted over the years by changes in land use, the introduction of a variety of point and non-point source pollutants, and changes in the river's hydrology. The present system of dams and locks has changed much of the length of the river from a free-flowing stream into a slower, deeper, series of reservoirs. Many of the native aquatic organisms were not able to adapt to these changes and have been largely or completely replaced by substantially fewer species capable of living in the modified habitats. It is unlikely that present conditions are likely to change during the time frame for this analysis (the next 50 years – the project design life) and possibly far longer. These present (baseline) conditions are described in detail in Chapter 3 of the 1996 FEIS.

The construction of dams has altered the sediment transport that affects many aquatic resources such as mussels and fish spawning beds. Riverine habitat was converted to lacustrine habitat except in the headwaters. Mussel populations are particularly vulnerable because of their sedentary life style. Many mussel species require specific flow conditions and are adapted to a riverine environment. Some river-dwelling species now survive only in the tailwaters of dams. In addition, the dams allow sediment and nutrients to accrete in the impounded sections. Bottom-dwelling organisms living upstream from the dams must contend with an overabundance of sediment and nutrients while organisms living just downstream from the dams must contend with extremely low levels of these elements. This can be detrimental both to the benthic organisms that are

inundated and smothered by the accretions, and to the organisms downstream that are deprived of their benefit.

Both point-source and nonpoint-source contaminants, particularly large amounts of sediment from construction, agriculture, and poor land management techniques, contribute to the accretion and the nutrient loading in reservoirs. Regulatory programs set standards to protect water and air quality criteria for the designated uses of the rivers and limit point source discharges. BMP programs regulate many nonpoint sources.

Large tows must make several cuts or breaks in the barges to process them through the lock. The towboats must constantly maneuver from side to side as well as in line with the channel. Although the wash from the tows is fairly insignificant when aligned with the channel, when the tows must move from side to side the wash can disturb adjacent mussel beds. The more cuts required, the greater the disturbance. Other tows that wait their turn often toe into the bank. This disturbs or physically disrupts the mussel beds they pass over (or in some cases grind over) and also damages the terrestrial vegetation at the point of impact. For these reasons, larger locks are preferable to smaller ones.

Fisheries and fish habitat conditions also have been stressed over the years by the change from a free-flowing riverine system to a regulated water release program. Although the present resources appear to have adjusted somewhat to modified habitat conditions, migratory fish species appear to find it more difficult, though not impossible, to reproduce in the series of reservoirs. Migratory fish are generally blocked from passage to potential spawning sites upstream by the dam. Presently, the only upstream passage available for the migratory fish is through Chickamauga Lock. If the lock were closed, fish populations would be limited to those presently in the reservoir pools and those that survive the downstream transit over the spillway or through the generators. Closure of Chickamauga Lock would further strain an already artificial ecology. Properly designed, however, a new lock could actually enhance the fish's present ability to migrate both upstream and downstream.

Individually, many factors listed above may not play a very significant role on aquatic resources, but when added together they have had a profound cumulative effect. Chickamauga Lock and Dam have contributed significantly to these impacts over the years. The impact of replacing the lock, however, would have only a minor effect on the overall system, and could actually provide minor improvements.

4.14.5 Air Quality

Short-term air quality impacts could result from burning debris, dust, and construction equipment exhaust, however, these impacts would tend to be localized. Long-term impacts will be more regional in scope. Past impacts were considered from the construction of Chickamauga Lock and Dam in 1940. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

The project impact area is affected by a variety of inter-related factors such as upstream land use changes, transportation activities, population trends and resulting pollution loads. Socioeconomic conditions include the demand for products transported by the river system and transportation costs for river traffic versus alternative modes of transport. Long locking times increase transportation costs and can force a shift to the alternative modes. River navigation is currently restricted due to the small size of the lock, which, in turn, leads to extended lockage times and added fuel consumption and exhaust from tugs cutting, locking, and reforming barges by processing only one barge at a time. This is considerable when a tow may contain as many as 15 barges. Some goods have been forced to shift to alternative modes of transportation. The alternative modes, i.e., truck and rail, may be less expensive for shipping costs in the short run, but they also add considerably to fuel consumption and air pollution.

Regulatory programs set standards to protect air quality criteria. Although Chattanooga has had air quality concerns in the past, air quality is currently acceptable. All of Tennessee is now an attainment area. The entire system of navigation locks on the Tennessee and Cumberland Rivers has contributed to this by reducing the number of trucks and trains, and thereby the amount of fuel, necessary to ship goods from one area to another.

Like most cities in the southeastern United States, the City of Chattanooga continues to grow. This urban and suburban growth increasingly stresses air quality and recent evidence suggests that large cities can even affect the weather in their immediate areas. A smaller lock (60 x 360) will contribute to these negative effects, whereas the larger the locks would slightly better the conditions. If the lock were closed altogether, these conditions would become worse due to total dependence on either truck or rail.

Man has had a significant cumulative impact on air quality in the region. The lock and dam system has made shipping large quantities of materials much more effective and has therefore contributed to the overall reduction of the cumulative negative impacts to air quality.

4.14.6 Threatened and Endangered Species

Although the project footprint for the proposed construction is well defined, the geographic scope for this analysis is considered regional and includes all areas in which the particular threatened or endangered species may be found. The specific project impact site is between Tennessee River Miles (TRM) 470.0 and 470.8. However, the project could affect some aquatic species for the length of the tailwater between TRM 458.0 and 470.8. Past impacts will be considered from the beginning of the historic period. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

A detailed biological assessment has been completed and is included in this document. Under Section 7 of the 1973 Endangered Species Act, the Corps and TVA have initiated formal consultation with the FWS. All of the mussels in areas that would be disturbed by

the construction would be collected by divers and relocated. Other mitigation measures might be included in the Biological Opinion to be issued by the FWS.

4.14.6.1 Endangered Mussels

As described in Aquatic Resources above, the Tennessee River is one of the richest rivers in the world with regard to aquatic biodiversity. These native resources have been severely impacted over the years by changes in land use, the introduction of a variety of point and non-point source pollutants, and changes in the river's hydrology. The present system of dams and locks has changed much of the length of the river from a free-flowing stream into a slower, deeper, series of reservoirs. Many of the native aquatic organisms were not able to adapt to these changes and have been largely or completely replaced by substantially fewer species capable of living in the modified habitats.

One Federally listed endangered mussel species has been found in the project area. The pink mucket *(Lampsilis abrupt*a) is a mussel found in low numbers at a number of locations throughout its range and a few individuals of this species have been found in the mussel bed along the right shore of the river where the approach channel is proposed to be widened. Other endangered mussel species might still occur in the project area; however, none have been found during any recent survey in the area. These endangered mussel species are significant from both a regional (population) and national standpoint (from the presence of Federal listed species).

The river systems were much different prior to the construction of the dam. Riverine habitats were converted to lacustrine habitats throughout the length of the mainstem Tennessee River. In addition, the aquatic habitat conditions have been stressed over the years by the change from a free-flowing riverine system to a regulated flow system. The construction of dams has altered the sediment bed transport that affects many aquatic resources such as the endangered mussels. Mussel populations are particularly vulnerable because of their sedentary life style. Many mussel species require specific flow conditions and are adapted to a riverine environment. Some river-dwelling species now survive only in the tailwaters. In addition, the dams allow sediment and nutrients to accrete in the impounded sections. Bottom dwelling organisms living upstream from the dams must contend with an overabundance of sediment and nutrients while organisms living just downstream from the dams must contend with extremely low levels of these elements. This can be detrimental both to the benthic organisms that are inundated and smothered by the accretions, and to the organisms downstream that are deprived of their benefit. Both point-source and nonpoint-source contaminants, particularly large amounts of sediment from construction, agriculture, and poor land management techniques, contribute to the accretion and to the nutrient loading.

Large tows must make several cuts or breaks in the barges to process them through the lock. The towboats must constantly maneuver from side to side as well as in line with the channel. Although the wash from the tows is fairly insignificant when aligned with the channel, when the tows must move from side to side the wash can disturb the adjacent mussel beds. The more cuts required, the greater the disturbance. Other tows that wait

their turn often toe into the bank. This disturbs the mussel beds they pass over (or in some cases grind over) and also damages the terrestrial vegetation at the point of impact. For these reasons, larger locks are preferable to smaller ones.

Many factors have impacted the endangered mussels and together they have brought some of these species to the verge of extinction. Chickamauga Lock and Dam, when it was built more than 60 years ago, undoubtedly contributed to these negative impacts. Construction of a new lock, however, would have an insignificant impact overall, and when complete may provide some positive benefits that would help offset past negative effects. Minimizing or preventing the need to breakup barge configurations would significantly reduce prop wash and the need for bank toe in by waiting barges.

4.14.6.2 Mountain Skullcap

Mountain skullcap (*Scutellaria montana*) is a federally endangered member of the mint family. It occupies areas of suitable habitat on the Big Ridge Habitat Protection Area located immediately adjacent to the TVA site designated for disposal of excavated material generated by lock construction. This herb requires shade provided by an intact forest canopy and is especially sensitive to encroachment from weed species when the forest canopy is removed. Individuals of this species are known to occur within 150 feet of the proposed spoil disposal site.

As the region was settled, vast tracts of forest were harvested for timber or cleared for agriculture. The surrounding land uses have changed from an almost unbroken forest to mixed agriculture, suburban, and forested land uses. With few exceptions, all of the virgin forests of the southeast have been cut at least once and most repeatedly. Species that were dependent on these forests have been fragmented or lost altogether. The mountain skullcap requires a thick, unbroken canopy. Man's clearing of the forests probably contributed to the current endangered condition of the mountain skullcap.

The present or baseline conditions are described in detail in Chapter 3 of the 1996 FEIS. Future conditions will probably be similar to the baseline with a continued shift toward more urbanization and fewer unbroken tracts of forest. Residential development in the areas adjacent to the lakes will likely grow at a faster rate with construction of recreational second-homes.

The Mountain skullcap, although Federally listed as threatened, is known at several other sites besides the one adjacent to the lock. This population is, in fact, one of the smaller known communities. Nevertheless, as a part of the construction process, not only would the entire site be preserved intact, but an additional protective buffer would be provided to ensure it remains undisturbed. The species would be completely avoided and therefore, no other mitigation would be required.

4.14.7 Cultural and Historic Resources.

Two historic structures, Chickamauga Lock and Dam and the Norfolk Southern Railway bridge, and their surroundings would be altered to varying degrees by each of the alternatives. Present conditions are the baseline conditions as described in Chapter 3 of the 1996 FEIS. Future conditions are projections for 50 years into the future (project design life).

The Chickamauga Lock and Dam complex is an eligible historic property under the National Register of Historic Places. The Norfolk Southern Railroad bridge is a potentially eligible National Register property. Both would either be significantly altered, or have its visual context changed, by project implementation of any of the alternatives.

The existing lock would eventually be closed under any of the alternatives. Construction of a new lock would obviously change the appearance of the dam. The new lock guide walls would extend under and beyond the bridge, thereby altering the surrounding view of the bridge. In addition, at least one of the support piers of the bridge would be surrounded or wrapped by metal sheet pilings to protect it from inadvertent collisions by barges, further altering the historic appearance of the bridge.

Physical alteration of the Chickamauga Lock and Dam and changes to the visual context of the adjacent Norfolk and Southern Railroad bridge will be necessary if a new lock is to be constructed.

Resulting work will adversely affect properties that are eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation is being notified and the Tennessee State Historic Preservation Officer (SHPO) is being consulted to determine how such adverse effects can be taken into account by avoidance, minimization, or mitigation. The adverse effects will be taken into account by stipulation within a Memorandum of Agreement.

5.0 List of Preparers

Andrew Barrass – Independent Technical Review
Position: Environmental Review Coordinator, Division of Natural Heritage, Tennessee Department of Environment and Conservation
Education: Ph.D.
Experience: 6 years Manager of State Nonpoint Source Water Control Program
7 years Environmental Review Coordinator

Harry Blazek – Project Study Manager
Position: Civil Engineer
Education: B.S., Civil Engineering
Experience: 31 years Project Planning

Joy Broach – Preparation of Biological Assessment
Position: Biologist, Project Planning Branch, U.S. Corps of Engineers
Education: M.S., Biology
Experience: 17 years Aquatic Biologist, Tennessee Department of Environment and Conservation
1 year Biologist U.S. Fish and Wildlife Service
1 year Biologist, U.S. Army Corps of Engineers

Patty Coffey – Environmental Team Leader
Position: Biologist, Project Planning Branch, U.S. Army Corps of Engineers
Education: M.S., Biology
Experience: 2 years Park Ranger
14 years Biologist, Project Planning Branch
3 years Outdoor Recreation Planner

Wayne Easterling – Principle Author of FSEIS
Position: Biologist, Project Planning Branch, U.S. Army Corps of Engineers
Education: B.A., Biology
Experience: 18 years Park Ranger
2 years Biologist, Project Planning Branch
3 years Project Manager

Steve Fraley – Aquatic biology
Position: Aquatic Biologist, Tennessee Valley Authority
Education: M.S., Zoology
Experience: 9 years Aquatic invertebrate biology and biological assessment techniques

Ray Hedrick – Independent Technical Review Team Leader
Position: Ecologist, Project Planning Branch, U.S. Army Corps of Engineers
Education: B.S., Wildlife Biology
Experience: 3 years Park Ranger
25 years Ecologist, Project Planning Branch

Dr. John J. Jenkinson – Mussels and Aquatic T&E
Position: Molusk Biologist, Resource Stewardship, Tennessee Valley Authority
Education: Ph.D., Zoology
Experience: 23 years aquatic endangered species, TVA

Robert Karwedsky – Cultural and Historic Resources
Position: District Archaeologist, U.S. Army Corps of Engineers
Education: M.S., Anthropology
Experience: 23 years Archaeologist

Dr. Linda Oxendine – NEPA Specialist
Position: Senior NEPA Specialist, Tennessee Valley Authority
Education: Ph. D., Botany
Experience: 24 years environmental education and environmental review requirements, TVA

Dave Rieger – Independent Technical Review
Position: Lead Landscape Architect, Project Planning Branch, U.S. Army Corps of Engineers, Pittsburgh District
Education: B.S., Landscape Architecture, B.S. Environmental Studies, M.S. Public Administration
Experience: 8 years, Cultural Resource Management
4 years NEPA Compliance
8 years, Master Planning

Jim Widlak – Coordination Act Report and Biological Opinion
Position: Fish and Wildlife Biologist, U.S. Fish and Wildlife Service
Education: M.S., Fisheries Science
Experience: 17 Years Fish and Wildlife Biologist, U.S. Fish and Wildlife Service

6.0 List Of Agencies, Organizations, And Persons To Whom Copies The Scoping Letter Was Sent

TWRA
MR. DAN SHERRY
P. O. BOX 40747
NASHVILLE, TN 37204

USFWS
MR. LEE BARCLAY
446 NEAL STREET
COOKEVILLE, TN 38501

MS. MARTY MARINA
TENNESSEE CONSERVATION LEAGUE
300 ORLANDO AVENUE
NASHVILLE, TN 37209

MR. HERBERT HARPER, THC SHPO
ATTN: MR. JOE GARRISON
CLOVER BOTTOM MANSION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442

U.S. EPA
REGION IV
345 COURTLAND ST.
ATLANTA, GA 30365

COMMISSIONER JUSTIN WILSON, TDEC
ATTN: MR. G. DODD GALBREATH
TDEC ENVIRONMENTAL POLICY OFFICE
21ST FLR., L&C TOWER, 401 CHURCH STREET
NASHVILLE, TN 37243-1530

TDEC - MR. DAN EAGAR
WPC-7TH FLOOR
L&C ANNEX
NASHVILLE, TN 37243-1534

TDEC
MR. REGGIE REEVES, DIR NATURAL HERITA
401 CHURCH STREET, L&C TOWER, 14TH FL
NASHVILLE, TN 37243-0447

NATURAL RESOURCES CONS. SVC.
STATE CONSERVATIONIST
ROOM 675 U.S. COURTHOUSE
801 BROADWAY
NASHVILLE, TN 37203

FARM SERVICES AGENCY
MR. DAVID MCDOYLE, EXECUTIVE DIRECTO
579 US COURTHOUSE
NASHVILLE, TN 37203

TENNESSEE VALLEY AUTHORITY
MR. JON M. LONEY
ENVIRONMENTAL MANAGEMENT
400 W. SUMMIT HILL DRIVE
KNOXVILLE, TN 37902-1499

USDA,APHIS,ADC
441 DONELSON PIKE
SUITE 340
NASHVILLE, TN 37214

TENNESSEE STATE PLANNING OFFICE
307 JOHN SEVIER BUILDING
500 CHARLOTTE AVENUE
NASHVILLE, TENNESSEE 37219-5082

ENVIRONMENTAL REVIEW COORDINATOR
DIVISION OF ECOLOGICAL SERVICES
TN DEPT OF ENV. & CONSERVATION
8TH FLOOR, L&C TOWER, 401 CHURCH ST.
NASHVILLE, TENNESSEE 37243-0447

TN DEPARTMENT OF AGRICULTURE
MR. LOUIS BUCK, DEPUTY COMMISSIONER
ELLINGTON AGRICULTURAL CENTER
BOX 40627
NASHVILLE, TENNESSEE 37204

THE NATURE CONSERVANCY
TENNESSEE FIELD OFFICE
50 VANTAGE WAY, SUITE 250
NASHVILLE, TENNESSEE 37215

TN DEPT OF TRANSPORTATION (TDOT)
MR. GLEN BECKWITH, PLANNING DIV
SUITE 900, JAMES POLK BUILDING
NASHVILLE, TN 37243-0334

TDECD
MR. WILTON BURNETTE
312 8TH AVE. N, 11TH FLOOR
NASHVILLE, TN 37243-0405

GERALD MILLER
61 FORSYTHE STREET
US EPA, OFFICE OF ENV. ASSESSMENT
ATLANTA, GEORGIA 30303-3104

MR. BOB ALLEN
7TH FLOOR
L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MS. JOYCE HOYLE
DIV, OF RECREATION SVCS
10TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

PAUL DAVIS, DIRECTOR
DIVISION OF WATER POLLUTION CONTROL
7TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

BARRY R. STEPHENS, DIRECTOR
DIVISION OF AIR POLLUTION CONTROL
9TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. DAVID DRAUGHON, DIRECTOR
DIVISION OF WATER SUPPLY
6TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. KENT TAYLOR, DIRECTOR
DIVISION OF GROUND WATER PROTECTION
10TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. JIM HAYNES, DIRECTOR
DIVISION OF SUPERFUND
4TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. WAYNE GREGORY, DIRECTOR
DIVISION OF UNDERGROUND STORAGE TANKS
4TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. HERBERT HARPER, THC SHPO
ATTN: MR. NICK FIELDER
CLOVER BOTTOM MANSION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442

MR. MIKE APPLE, DIRECTOR
DIVISION OF SOLID WASTE MANAGEMENT
5TH FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. LAWRENCE NANNEY, DIRECTOR
DIVISION OF RADIOLOGICAL HEALTH
3RD FLOOR, L&C TOWER
401 CHURCH STREET
NASHVILLE, TENNESSEE 37243

MR. ERIC SOMERVILLE
US ENVIRONMENTAL PROTECTION AGENCY
REGION IV – WETLANDS SECTION
61 FORSYTH STREET, S.W.
ATLANTA, GEORGIA 30303

TED NELSON
TENNESSEE VALLEY AUTHORITY
400 WEST SUYMMIT HILL DRIVE
KNOXVILLE, TN 37902-1499

HONORABLE ZACH WAMP 2 COPIES
UNITED STATES REPRESENTATIVE
HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

HONORABLE ZACH WAMP
UNITED STATES REPRESENTATIVE
HOUSE OF REPRESENTATIVES
900 GEORGIA AVENUE, SUITE 126
CHATTANOOGA, TN 37402

HONORABLE JOHN J. DUNCAN, JR.
UNITED STATES REPRESENTATIVE
HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515-4202

HONORABLE BILL FRIST
UNITED STATES SENATOR
UNITED STATES SENATE
WASHINGTON, DC 20510-4201

REBUILD TENNESSEE
MR. BILL DOBBINS
PO BOX 40645
NASHVILLE, TN 37204

KENTUCKY-CUMBERLAND COAL COMPANY
ATTN: MR. JAMES R. GILLUM
P.O. BOX 151
403 N. TENNESSEE AVE., SUITE 1
LAFOLLETTE, TN 37766

VOLUNTEER BARGE & TRANSPORT, INC.
ATTN: MR. J. RICHARD HOMMRICH
P.O. BOX 178181
NASHVILLE, TN 37217-8181

SOUTHERN MARINE CONSTRUCTION CO.
ATTN: MR. PETER SERODINO
100 HAMM ROAD
P.O. BOX 4539
CHATTANOOGA, TN 37405-0539

TENNESSEE VALLEY TOWING, INC.
ATTN: MR. WILLIAM H. DYER
3594 LONE OAK ROAD
PADUCAH, KY 42003

TENNESSEE RIVER VALLEY ASSOCIATION
ATTN: JAN CASEY JONES
P.O. BOX 1745
1408 5TH AVE., S.E. SUITE 4
DECATUR, AL 35602

THE TENNESSEE TOMBIGBEE
WATERWAY DEVELOPMENT AUTHORITY
POST OFFICE DRAWER 671
COLUMBUS, MISSISSIPPI 39703

HONORABLE FRED THOMPSON
UNITED STATES SENATOR
UNITED STATES SENATE
WASHINGTON, DC 20510

U.S. DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
1222 SPRUCE STREET
ST. LOUIS MO 63103-2832

VULCAN MATERIALS COMPANY
MIDEAST DIVISION
ATTN: MR. CHARLIE RITCHIE
113 MULBERRY STREET
NORFOLK, VA 23523

TENNESSEE RIVER VALLEY ASSOCIATION
ATTN: MS. JANICE L. JONES
P.O. BOX 1745
1408 5TH AVE., S.E. SUITE 4
DECATUR, AL 35602

INGRAM MATERIALS COMPANY
ATTN: MR. CHARLES J. SANDERS, III
ONE BELLE MEADE PLACE
4400 HARDING ROAD
NASHVILLE, TN 37205-2290

SERODINO, INC.
ATTN: V. P. SERODINO
100 HAMM ROAD
P.O. BOX 4539
CHATTANOOGA, TN 37405-0539

B W EDWARDS
CONNOR & ASSOCIATES
PO BOX 681
BLUFFTON, SC 29910

CLAUDE RAMSEY
HAMILTON COUNTY EXECUTIVE
HAMILTON COUNTY COURTHOUSE
CHATTANOOGA, TN 37402

NORMAN EDWARDS,
EXECUTIVE SECRETARY
INLAND WATERWAYS USERS BOARD
WASHINGTON, D.C. 20314-1000

TIMOTHY PARKER, JR, PRESIDENT
PARKER TOWING COMPANY, INC
TUSCALOSA, AL

AMERICAN COMMERCIAL BARGE LINE
PO BOX 610
JEFFERSONVILLE, IN 47131-0610

DIRECTOR WESTERN RIVER OPERATIONS
8TH COAST GUARD DISTRICT
1222 SPRUCE STREET
ST. LOUIS, MO 63103-2832

MATT STEVENSON
DOCK HDWE & MARINE FABRICATION
60 NAPCO DR.
TERRYVILLE, CT 06786

VINCENT MORASCO
3 CEDAR STREET
BATAVIA, NY 14020

MARY WELLS
EARTH JUSTICE LEGAL DEFENSE FUND
1625 MASSACHUSETTS AVE. NW STE 702
WASHINGTON, DC 20036

US EPA
REGION IV – WETLANDS SECTION
61 FORSYTH STREET
ATLANTA, GA 30303-3104

FEMA
REGIONAL ENVIRONMENTAL OFFICER
3003 CHAMBLEE TUCKER ROAD
ATLANTA, GA 30341

WJOC
805 CHICKAMAUGA AVE
ROSSVILLE, GA 30741

HOLLAND DIVING SERVICE
PO BOX 939
DECATUR, AL 35602

GREG THACKER
45 AQUA VISTA DRIVE
KILLEN, AL 35645

COUNTY EXECUTIVE
12021 BELL MOUNTAIN DRIVE SW
HUNTSVILLE, AL 35803-3405

HARPETH RIVER WATERSHED AUTHORITY
PO BOX 1127
FRANKLIN, TN 37065

A. DAVID MCKINNEY
TWRA
PO BOX 40747
NASHVILLE, TN 37204

TENNESSEE GOVERNOR'S OFFICE
STATE CAPITOL BUILDING
NASHVILLE, TN 37219

TENNESSEE DIVISION OF ARCHAEOLOGY
5103 EDMONSON PIKE
NASHVILLE, TN 37211-5129

TENNESSEE HISTORICAL COMMISSION
ATTN HERBERT HARPER
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442

TENNESSEE COMMISSION OF INDIAN AFFA
7TH FLOOR, L&C ANNEX
401 CHURCH STREET
NASHVILLE, TN 37243-1534

ROBERT MCKEE
TENNESSEE STATE REPRESENTATIVE
536 BREWER STREET
ATHENS, TN 37303

MCMINN COUNTY EXECUTIVE
CITY HALL
ATHENS, TN 37303

THE DAILY POST ATHENIAN
320 S. JACKSON STREET
PO BOX 340
ATHENS, TN 37303

WJSQ-FM
2110 OXNORD ROAD
PO BOX 986
ATHENS, TN 37303

WYXI-AM
112 E. MADISON AVE
PO BOX 1390
ATHENS, TN 37303

MAYOR OF BENTON
CITY HALL
BENTON, TN 37307

J. CHRIS NEWTON
TENNESSEE STATE REPRESENTATIVE
RT 2, BOX 322A CHEROKEE CIRCLE
BENTON, TN 37307

POSTMASTER
UNITED STATES PO BOX
BENTON, TN 37307

US FOREST SERVICE
OCOEE RANGER DISTRICT
ROUTE 3, BOX 348D
BENTON, TN 37307

WBIN
PO BOX 799
BENTON, TN 37307

WBIN-AM
HWY 411 N
PO BOX K
BENTON, TN 37037

THE POLK COUNTY NEWS
CITIZEN ADVANCE
PO BOX 129
BENTON, TN 37307

POSTMASTER
UNITED STATES PO BOX
CALHOUN, TN 37309

CHARLESTON MARINE TRANSPORT, INC
PO BOX 375
CHARLESTON, TN 37310-0375

DEWAYNE BUNCH
TENNESSEE STATE REPRESENTATIVE
804 HOLLEY RIDGE DRIVE
CLEVELAND, TN 37311

COUNTY EXECUTIVE
BRADLEY COUNTY COURTHOUSE
CLEVELAND, TN 37311

MAYOR OF CLEVELAND
CITY HALL
CLEVELAND, TN 37311

POSTMASTER
UNITED STATES PO BOX
CLEVELAND, TN 37311

LARRY DUNN
1920 CAMPBELL DRIVE
CLEVELAND, TN 37312

WCLE-AM & FM
4009 KEITH STREET NW #205
CLEVELAND, TN 37312-4361

CLEVELAND BANNER
PO BOX 3600
CLEVELAND, TN 37320

CLEVELAND DAILY BANNER
1505 25TH ST
PO BOX 3600
CLEVELAND, TN 37320-3600

MAYOR OF DALTON
CITY HALL
PO BOX 226
DAYTON, TN 37321

POSTMASTER
UNITED STATES PO BOX
DAYTON, TN 37321

RHEA COUNTY EXECUTIVE
MR. JIMMY WILKEY
1475 MARKET STREET
DAYTON, TN 37321

THE HERALD-NEWS
135 W. MAIN STREET
PO BOX 286
DAYTON, TN 37321

RAYMOND WALKER
TENNESSEE STATE REPRESENTATIVE
PO BOX 626
DAYTON, TN 37321

WDNT-AM & WTCX-FM
2017 HWY 27 S
PO BOX 290
DAYTON, TN 37321

COUNTY EXECUTIVE
OFFICE OF COUNTY EXECUTIVE
DECATUR, TN 37322

POSTMASTER
UNITED STATES PO BOX
DECATUR, TN 37322

BOBBY G. WOOD
TENNESSEE STATE REPRESENTATIVE
7733 LASATA LANE
HARRISON, TN 37341

FRIENDS OF NORTH CHICKAMAUGA
CREEK GREENWAY
PO BOX 358
HIXSON, TN 37343

MARION COUNTY DEPARTMENT
OF TRANSPORTATION
JASPER, TN 37347

MAYOR OF JASPER
CITY HALL
JASPER, TN 37347

POSTMASTER
UNITED STATES PO BOX
JASPER, TN 37347

THE JASPER JOURNAL
926 E. MAIN STREET
PO BOX 398
JASPER, TN 37347

WAPO-AM
29 W. MAIN STREET
JASPER, TN 37347

THE DEMOCRAT
107 COLLEGE STREET
PO BOX 8
MADISONVILLE, TN 37354

ATHENS DAILY POST
PO BOX 340
ATHENS, TN 37371

WYXI
PO BOX 1390
ATHENS, TN 37371

WILKEY
4450 SHACKLEFORD RIDGE ROAD
SIGNAL MOUNTAIN, TN 37377-1221

GENE ELSEA
TENNESSEE STATE SENATOR
PO BOX 609
SPRING CITY, TN 37381

CHATTANOOGA FREE PRESS
PO BOX 1447
CHATTANOOGA, TN 37401

THE CHATTANOOGA TIMES
117 E. TENTH STREET
PO BOX 951
CHATTANOOGA, TN 37401

WGOW
PO BOX 11202
CHATTANOOGA, TN 37401

COUNTY EXECUTIVE
MONROE COUNTY TENNESSEE
MADISONVILLE, TN 37354

HONORABLE DON BIRD
TENNESSEE STATE REPRESENTATIVE
PO BOX 563
CLEVELAND, TN 37364

WLAR
PO BOX 986
ATHENS, TN 37371

LEAF AND CIELO MYCZACK
OFFICE OF THE RIVERKEEPER
PO BOX 90
SALE CREEK TN 37373

SOUTH PITTSBURGH HUSTLER
PO BOX 765
SOUTH PITTSBURGH, TN 37380

GEORGE W. FRALEY
TENNESSEE STATE REPRESENTATIVE
1350 BIBLE CROSSING ROAD
WINCHESTER, TN 37398

CHATTANOOGA TIMES
PO BOX 951
CHATTANOOGA, TN 37401

WDOD
PO BOX 1449
CHATTANOOGA, TN 37401

DAVID FOWLER
TENNESSEE STATE SENATOR
PO BOX 1749
CHATTANOOGA, TN 37401-1749

THE AMERICAN WATER COMPANY
PO BOX 6338
CHATTANOOGA, TN 37401-6338

CHATTANOOGA HAMILTON COUNTY
REGIONAL PLANNING COMMITTEE
200 CITY HALL ANNEX
CHATTANOOGA, TN 37402

CHATTANOOGA NEWS FREE PRESS
400 E. 11TH STREET
PO BOX 1447
CHATTANOOGA, TN 37402

WARD CRUTCHFIELD
TENNESSEE STATE SENATOR
707 GEORGIA AVENUE
CHATTANOOGA, TN 37402

HAMILTON COUNTY EXECUTIVE
HAMILTON COUNTY COURTHOUSE
CHATTANOOGA, TN 37402

MAYOR OF CHATTANOOGA
E. 11TH STREET
CHATTANOOGA, TN 37402

RIVERFRONT DOWNTOWN PLANNING CENTER
SECOND FLOOR MILLER PLAZA
850 MARKET STREET
CHATTANOOGA, TN 37402

THE RIVER CITY COMPANY
835 GEORGIA AVE. STE 500
CHATTANOOGA, TN 37402-2263

TOMMIE F. BROWN
TENNESSEE STATE REPRESENTATIVE
603 HIGHLAND PARK AVE.
CHATTANOOGA, TN 37404

BRENDA KAYE TURNER
TENNESSEE STATE REPRESENTATIVE
1101 DODDS AVE
CHATTANOOGA TN 37404

WDYN
1815 UNION AVE
CHATTANOOGA, TN 37404

WRCB
900 WHITEHALL ROAD
CHATTANOOGA, TN 37405

WRCB-TV
900 WHITEHALL ROAD
PO BOX 4295
CHATTANOOGA, TN 37405

POSTMASTER
UNITED STATES PO BOX
CHATTANOOGA, TN 37406

WTCI
4411 AMNICOLA HWY
CHATTANOOGA, TN 37406

WTVC
PO BOX 60028
CHATTANOOGA, TN 37406

WTVC-TV
PO BOX 60028
CHATTANOOGA, TN 37406-6028

WDEF
3300 BROAD STREET
CHATTANOOGA, TN 37408

WDEF-TV
3300 BROAD STREET
CHATTANOOGA, TN 37408

WDSI
1101 E. MAIN STREET
CHATTANOOGA, TN 37408

JACK SHARP
TENNESSEE STATE REPRESENTATIVE
3211 RINGGOLD ROAD
CHATTANOOGA, TN 37412

BILL H. MCAFEE
TENNESSEE STATE SENATOR
PO BOX 15008
CHATTANOOGA, TN 37415

WFLI
6024 SHALLOWFORD ROAD #100
CHATTANOOGA, TN 37421

KENNETH DUBKE
TENNESSEE ORNITHOLOGICAL SOCIETY
7511 SHALLOWFORD ROAD
CHATTANOOGA, TN 37421-2696

HAMILTON COUNTY HERALD
PO BOX 21279
CHATTANOOGA, TN 37424

WGOC
162 FREE HILL ROAD
JOHNSON CITY, TN 37615-3144

DAN LIVORSI
PIONEER LANDING
105 COWAN TOWN ROAD
BUTLER, TN 37640

POSTMASTER
UNITED STATES PO BOX
ALCOA, TN 37701

WBCR
PO BOX 130
ALCOA, TN 37701

HONORABLE JERRY E. CROSS
TENNESSEE STATE REPRESENTATIVE
PO BOX 277 DOGWOOD ROAD
CARYVILLE, TN 37714

MARVIN GENE CALDWELL
TENNESSEE STATE REPRESENTATIVE
530 RIVERSIDE DRIVE
CLINTON, TN 37716

CLINTON COURIER NEWS
233 N. HICKS STREET
PO BOX 270
CLINTON, TN 37716

COUNTY EXECUTIVE
ANDERSON COUNTY COURTHOUSE
RM 208
CLINTON, TN 37716

MAYOR OF CLINTON
MUNICIPAL BUILDING
CLINTON, TN 37716

POSTMASTER
UNITED STATES PO BOX
CLINTON, TN 37716

WYSH-AM
SPRING STREET
PO BOX 329
CLINTON, TN 37716

JIM BOYER
TENNESSEE STATE REPRESENTATIVE
4501 IDUMEA ROAD
CORRYTON, TN 37721

DOUGLAS E. GUNNELS
TENNESSEE STATE REPRESENTATIVE
20467 HWY 95 NSTE 302
GREENBACK, TN 37742

WILLIAM BAIRD
TENNESSEE STATE REPRESENTATIVE
1375 APPALACHIAN HWY
JACKSBORO, TN 37757

HARRIMAN RECORD
PO BOX 610
KINGSTON, TN 37763

POSTMASTER
UNITED STATES PO BOX
KINGSTON, TN 37763

THE ROANE COUNTY NEWS
204 FRANKLIN STREET
PO BOX 610
KINGSTON, TN 37763

ROANE COUNTY EXECUTIVE
PO BOX 643
KINGSTON, TN 37763-0643

LENOIR CITY NEWS HERALD
PO BOX 310
LENOIR CITY, TN 37771

NEWS HERALD
508 E. BROADWAY
PO BOX 310
LENOIR CITY, TN 37771

POSTMASTER
UNITED STATES PO BOX
DEER LODGE, TN 37726

WILLIAM E. SAMS
SOUTHWEST POINT GOLF COURSE
1427 SWAN POND ROAD
HARRIMAN, TN 37748

DENNIS J. FERGUSON
TENNESSEE STATE REPRESENTATIVE
334 SUNRISE DRIVE
KINGSTON, TN 37763

STEVE MCCARTY
TRI COUNTY SPORTSMEN'S CLUB
PO BOX 1112
KINGSTON, TN 37763

ROCKWOOD TIMES
BOX 610
KINGSTON, TN 37763

WBBX-AM
PO BOX 389
KINGSTON, TN 37763-0389

RICK KIRBY
127 CLEAR COVE COURTS
LENOIR CITY, TN 37771

MAYOR OF LENOIR CITY
CITY HALL
LENOIR CITY, TN 37771

POSTMASTER
UNITED STATES PO BOX
LENOIR CITY, TN 37771

WLIL-AM & FM
406 E. BROADWAY
PO BOX 340
LENOIR CITY, TN 37771

POSTMASTER
UNITED STATES PO BOX
LOUDON, TN 37774

PAT HUFFMAN
TOWN OF LOUISVILLE
PO BOX 215
LOUISVILLE, TN 37777

HOWARD T. KERR
TENNESSEE STATE REPRESENTATIVE
1728 BIG SPRINGS ROAD
MARYVILLE, TN 37801

HONORABLE CARL O. KOELLA
TENNESSEE STATE SENATOR
215 ELLIS AVE
MARYVILLE, TN 37801-0006

THE DAILY TIMES
307 E. HARPER AVE
PO BOX 9740
MARYVILLE, TN 37802-9740

WGAP-AM & WGAP-FM
316 COURT STREET
PO BOX 4939
MARYVILLE, TN 37803

HONORABLE JAMES R. MCNALLY
TENNESSEE STATE SENATOR
121 AMANDA DRIVE
OAK RIDGE, TN 37830

OAK RIDGER
PO BOX 3446
OAK RIDGE, TN 37831

NEWS HERALD
412 WHARF STREET
PO BOX 276
LOUDON, TN 37774

WLOD-AM
405 MULBERRY STREET
PO BOX 464
LOUDON, TN 37774

COUNTY EXECUTIVE
BLOUNT COUNTY COURTHOUSE
MARYVILLE, TN 37801

MAYOR OF MARYVILLE
CITY HALL
MARYVILLE, TN 37801

MARYVILLE TIMES
PO BOX 9740
MARYVILLE, TN 37802

JOE MCCORD
TENNESSEE STATE REPRESENTATIVE
4222 MONTVALE ROAD
MARYVILLE, TN 37803

WILLIAM C. CLABOUGH
TENNESSEE STATE SENATOR
4702 WILDWOOD ROAD
MARYVILLE, TN 37804

POSTMASTER
UNITED STATES PO BOX
OAK RIDGE, TN 37830

SEVIERVILLE MOUNTAIN PRESS
PO BOX 3446
OAK RIDGE, TN 37831

WILLIAM E. ISSEL
CITY OF OAK RIDGE
PO BOX 1
OAK RIDGE, TN 37831-0001

BIG SOUTH FORK RIVER & REC AREA
SUPERINTENDENT
4564 LEATHERWOOD ROAD
ONEIDA, TN 37841

MONROE COUNTY ADVOCATE
PO BOX 389
SWEETWATER, TN 37874

THE DEMOCRAT
BOX 389
SWEETWATER, TN 37874

MAYOR OF VONORE
PO BOX 218
VONORE, TN 37885

POSTMASTER
UNITED STATES PO BOX
VONORE, TN 37885

POSTMASTER
UNITED STATES PO BOX
WARTBURG, TN 37887

THE MORGAN COUNTY NEWS
224 MAIDEN STREET
PO BOX 346
WARTBURG, TN 37887

WECO-AM
CHURCH STREET
PO BOX 100
WARTBURG, TN 37887

CITY OF KNOXVILLE
C/O SAM PARNELL
PO BOX 1631
KNOXVILLE, TN 37901

HONORABLE BUD GILBERT
TENNESSEE STATE SENATOR
PO BOX 442
KNOXVILLE, TN 37901

MAYOR OF KNOXVILLE
PO BOX 1631
KNOXVILLE, TN 37901

WATE-TV
1306 N. BROADWAY
PO BOX 2349
KNOXVILLE, TN 37901

KNOXVILLE NEWS SENTINEL
208 W. CHURCH AVE.
KNOXVILLE, TN 37902

HONORABLE WAYNE A. RITCHIE
TENNESSEE STATE REPRESENTATIVE
606 W. MAIN AVE
KNOXVILLE, TN 37902

TENNESSEE VALLEY AUTHORITY
W. TOWER 10C
400 W. SUMMIT HILL DRIVE
KNOXVILLE, TN 379902

TIM BURCHETTE
TENNESSEE STATE REPRESENTATIVE
8220 BENNINGTON DRIVE
KNOXVILLE, TN 37909

GARY F. NORVELL
BATSON, HIMES, NORVELL, AND POE
4334 PAPERMILL ROAD
KNOXVILLE, TN 37909

JOSEPH E. ARMSTRONG
TENNESSEE STATE REPRESENTATIVE
2624 SELMA AVE
KNOXVILLE, TN 37914

WATE
1306 BROADWAY NE
KNOXVILLE, TN 37917

WBIR
1513 HUTCHISON AVE
KNOXVILLE, TN 37917

WKOP
1611 E. MAGNOLIA AVE
KNOXVILLE, TN 37917

WYLV
1621 E. MAGNOLIA AVE
KNOXVILLE, TN 37917

BILL DUNN
TENNESSEE STATE REPRESENTATIVE
5309 LA VESTA ROAD
KNOXVILLE, TN 37918

FORT LOUDON/TELLICO LAKE USERS ASSOC
5204 RIVERBRIAR ROAD
KNOXVILLE, TN 37919

JAMIE HAGOOD
TENNESSEE STATE REPRESENTATIVE
1020 W. NOKOMIS CIRCLE
KNOXVILLE, TN 37919

WBIR-TV
1513 HUTCHISON AVE
KNOXVILLE, TN 37919

W.F. MARTIN
516 RENFORD DRIVE
KNOXVILLE, TN 37919-4304

TENNESSEE STATE SENATOR BEN ATCHLEY
6324 BOWSTRING TRAIL
KNOXVILLE, TN 37920

POSTMASTER
UNITES STATES PO BOX
KNOXVILLE, TN 37920

DEPARTMENT OF ENVIRONMENT & CONSERV
2700 MIDDLEBROOK PIKE STE 200
KNOXVILLE, TN 37921

PRESS ENTERPRISE
11863 KINGSTON PIKE
KNOXVILLE, TN 37922

WALTER PERRY
11618 CRYSTAL BROOK LANE
KNOXVILLE, TN 37922-1662

S.M. RUDDER
TELLICO LAKE USERS ASSOC
12108 WARRIOR TRAIL
KNOXVILLE, TN 37922-5459

HARRY U. TINDELL
TENNESSEE STATE REPRESENTATIVE
PO BOX 27325
KNOXVILLE, TN 37927-7325

HONORABLE H. E. BITTLE
TENNESSEE STATE REPRESENTATIVE
2947 W. GALLAHER FERRY ROAD
KNOXVILLE, TN 37932

H. E. BITTLE
TENNESSEE STATE REPRESENTATIVE
2947 W. GALLAHER FERRY ROAD
KNOXVILLE, TN 37932

EAST TENNESSEE DEVELOPMENT DISTRICT
ATTN: MR. ROBERT E. FREEMAN
PO BOX 19806
5616 KINGSTON PIKE
KNOXVILLE, TN 37939-2806

THE KNOXVILLE NEWS SENTINEL
208 W. CHURCH AVE
PO BOX 59038
KNOXVILLE, TN 37950

WKXT-TV
1100 SHARPS RIDGE
PO BOX 59088
KNOXVILLE, TN 37950

MONROE COUNTY EXECUTIVE
MONROE COUNTY COURTHOUSE
MADISONVILLE, TN 38354

JOHN M. WINDLE
TENNESSEE STATE REPRESENTATIVE
PO BOX 707
LIVINGSTON, TN 38570

LINCOLN DAVIS
TENNESSEE STATE SENATOR
PO BOX 96
PALL MALL TN 38577

SHELBY A. RHINEHART
TENNESSEE STATE REPRESENTATIVE
PO BOX 128
SPENCER, TN 38585

TENNESSEE VALLEY TOWING, INC
3594 LONE OAK ROAD
PADUCAH, KY 42001

R&W MARINE, INC
PO BOX 1400
REIDLAND, KY 42002-1400

MIDLAND ENTERPRISES, INC.
BOX 1460
CINCINATI OH 45202

PETER ALAN
306 POTOMAC DRIVE
BASKING RIDGE, NJ 07920-3123

RONALD STEWART
116 LENOAK DRIVE
LOUISVILLE, KY 40214

PAUL BOOTH
ARCADIS
611 CHESTNUT STREET, SUITE 200
CHATTANOOGA, TN 37450

HARRY N. COOK, PRESIDENT
NATIONAL WATERWAYS CONFERENCE, INC
1130 17TH STREET, NORTHWEST
WASHINGTON, DC 20036-4676

LOUDON CO. ECONOMIC DEVELOPMENT AC
274 BLAIR BEND
LOUDON, TN 37774

SMOKY MOUNTAIN TRANSFER CORP
9725 COGDILL ROAD, SUITE 203
KNOXVILLE, TN 37932

MR. RICHARD W. BROWN
BASIC RESOURCES, INC.
9041 EXECUTIVE PARK DRIVE
SUITE 116
KNOXVILLE, TN 37923-4603

MR. DOUG MORTENSEN
TATE & LYLE NORTH AMERICA
2200 E. ELDORADO ST.
DECATUR, IL 62525

KENNETH SIGLER
PARKER TOWING COMPANY, INC
TUSCALOSA, AL

MR. DON WALTON, ADMINISTRATOR
TENNESSEE-TOMBIGBEE WATERWAY DEV. AUTH.
PO DRAWER 671
COLUMBUS, MS 39703

MR. BRIAN PEARSON, PLANT MANAGER
OLIN CHLOR ALKALI PRODUCTS
LOWER RIVER ROAD
PO BOX 248
CHARLESTON, TN 37310-0248

MR. KEN YAGER, ROANE COUNTY EXECUTIVE
OFFICE OF THE COUNTY EXECUTIVE
200 E. RACE STREET, SUITE 1
PO BOX 643
KINGSTON, TN 37763

MR. BRENT GREER, HENRY COUNTY EXECUTIVE
HENRY COUNTY COURTHOUSE
PARIS, TN 38242

MR. KENNETH A. WHEELER
1279 HEDGE LANE
PADUCAH, KY 42001

MR. ROBERT BREWER, PORT CAPTAIN
CROUNSE CORPORATION
2626 BROADWAY
PADUCAH, KY 42001

FRANK MCKEE, AICP
UNIVERSITY OF TENNESSEE
226 CAPITOL BOULEVARD BUILDING
SUITE 400
NASHVILLE, TN 37219-1804

JAMES F. PALMER, MAYOR
OFFICE OF THE MAYOR
CITY OF CALHOUN, GA
PO BOX 248
CALHOUN, GA 30703-0248

JOHNNY C. BROWN, MAYOR
PO BOX 1000
RUSSELVILLE, AL 35653

MR. JOHN MCINTOSH, PRESIDENT
OLIN CHLOR ALKALI PRODUCTS
490 STUART ROAD, NE
CLEVELAND, TN 37312

MR. JOE C. RYTLEWSKI
OLIN CHLOR ALKALI PRODUCTS
490 STUART ROAD, NE
CLEVELAND, TN 37312

D. GARY DAVIS, BRADLEY COUNTY
EXECUTIVE
PO BOX 1167
CLEVELAND, TN 37364

MR. W. R. COLES, P.E.
W.R. COLES & ASSOCIATES
120 29TH AVENUE SOUTH
PO BOX 121684
NASHVILLE, TN 37212

MR. TONY HARGREAVES
NORTH AMERICAN EQUIPMENT SALES CO.,
350 MEMORIAL DRIVE
PO BOX 569
NICHOLASVILLE, KY 40356

RAY T. BURKHART, PRESIDENT
BURKHART ENTERPRISES, INC.
2435 ASBURY ROAD
PO BOX 6131
KNOXVILLE, TN 37914

BONNIE ROBBINS
NORTH AMERICAN SALT COMPANY
8300 COLLEGE BOULEVARD
OVERLAND PARK, KS 66210

JOHN B. HERBERT, PRESIDENT
HERBERT SANGRAVL CO., INC
PO DRAWER 279
900 HERBERT ROAD
NEW JOHNSONVILLE, TN 37134

HONORABLE DON SUNDQUIST, GOVERNOR
STATE OF TENNESSEE
STATE CAPITOL
NASHVILLE, TN 37243-0001

TONY GRANDE
TN DEPT OF ECONOMIC AND COMMUNITY DEV
312 8TH AVE NORTH
11TH FLOOR
NASHVILLE, TN 37243

WILTON BURNETTE, JR.
TN DEPT OF ECONOMIC AND COMMUNITY
312 8TH AVE NORTH
11TH FLOOR
NASHVILLE, TN 37243

JAMES R. GILLUM, EX VICE PRESIDENT
KENTUCKY-CUMBERLAND COAL COMPANY
PO BOX 151
403 N. TENNESSEE AVE., SUITE 1
LAFOLLETTE, TN 37766

MATHEW C. KOUPAL
ROWELL CHEMICAL CORPORATION
15 SALT CREEK LANE, SUITE 205
HINSDALE, IL 60521

7.0 Index